

2022 Spring Flood Outlook: Red River and Devils Lake Basins

February 10, 2022

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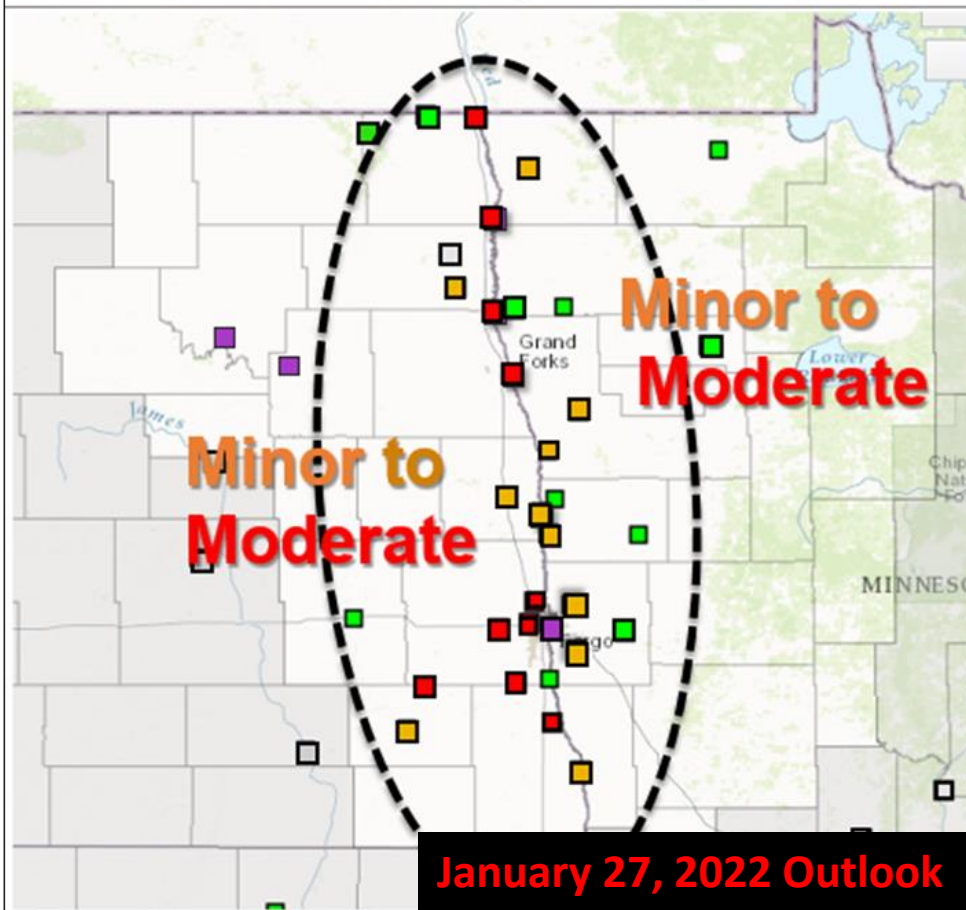
Photo courtesy of Vince Godon

Bottom Line up Front:

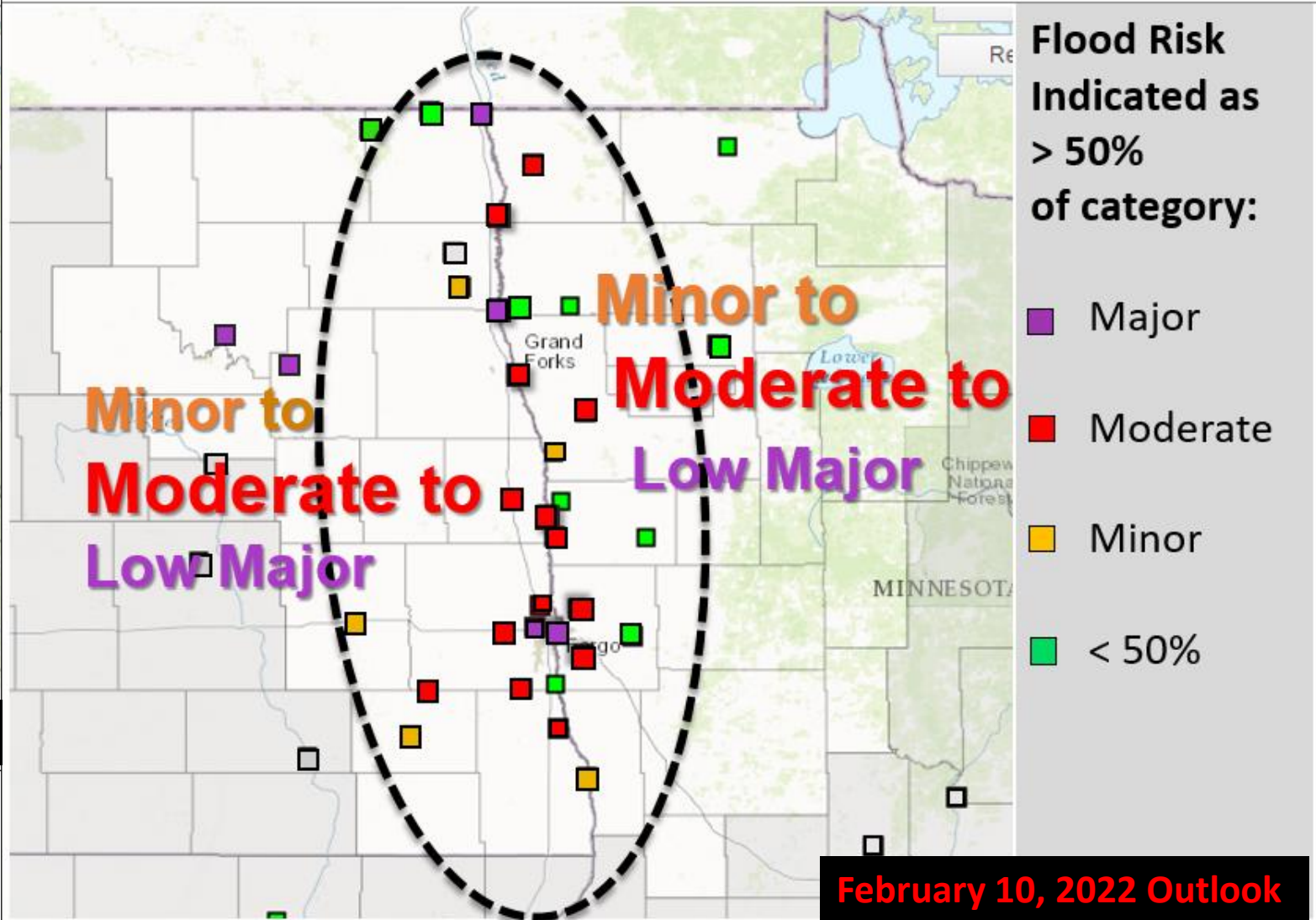
- Risk for *significant flooding* is overall a bit higher than historic* (raised slightly since January 27th outlook).
- *Minor to moderate flooding* is the main threat with some pockets of *low end major flooding*.
 - Dry/drought conditions from 2021 are much improved due to fall precipitation.
 - Soil moisture and base streamflow near normal.
 - Snowpack/snow water content near to above normal.
- February climate predictions suggest above normal temperatures with equal chances for below/normal/above precipitation.
- March/April/May climate predictions suggest equal chances for below/normal/above temperatures and precipitation (i.e., no strong signal in any direction).

Flood Risk by Category at River Forecast Points

Near to Above Normal Runoff Expected... depending on Feb-Mar

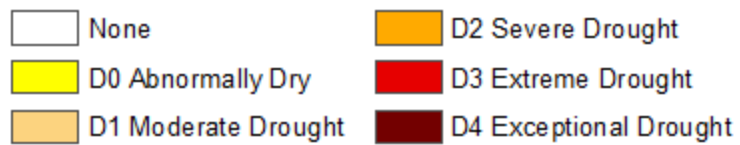
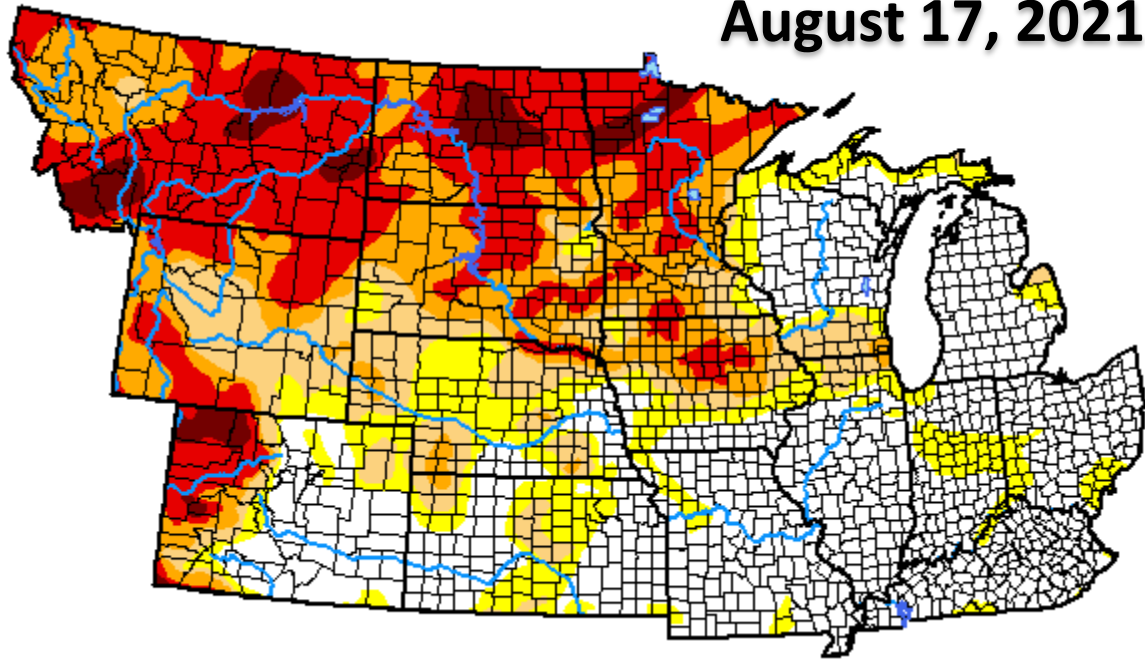


Near to Above Normal Runoff Expected... depending on Feb-Mar-Apr precipitation!



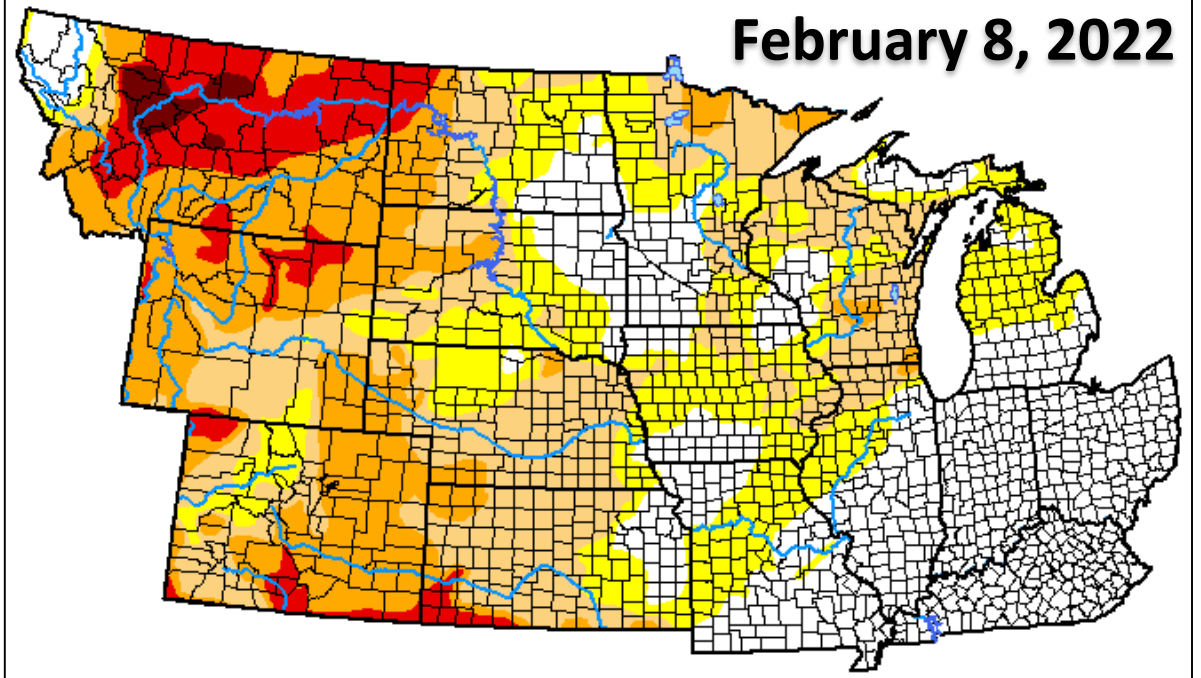
U.S. Drought Monitor

August 17, 2021



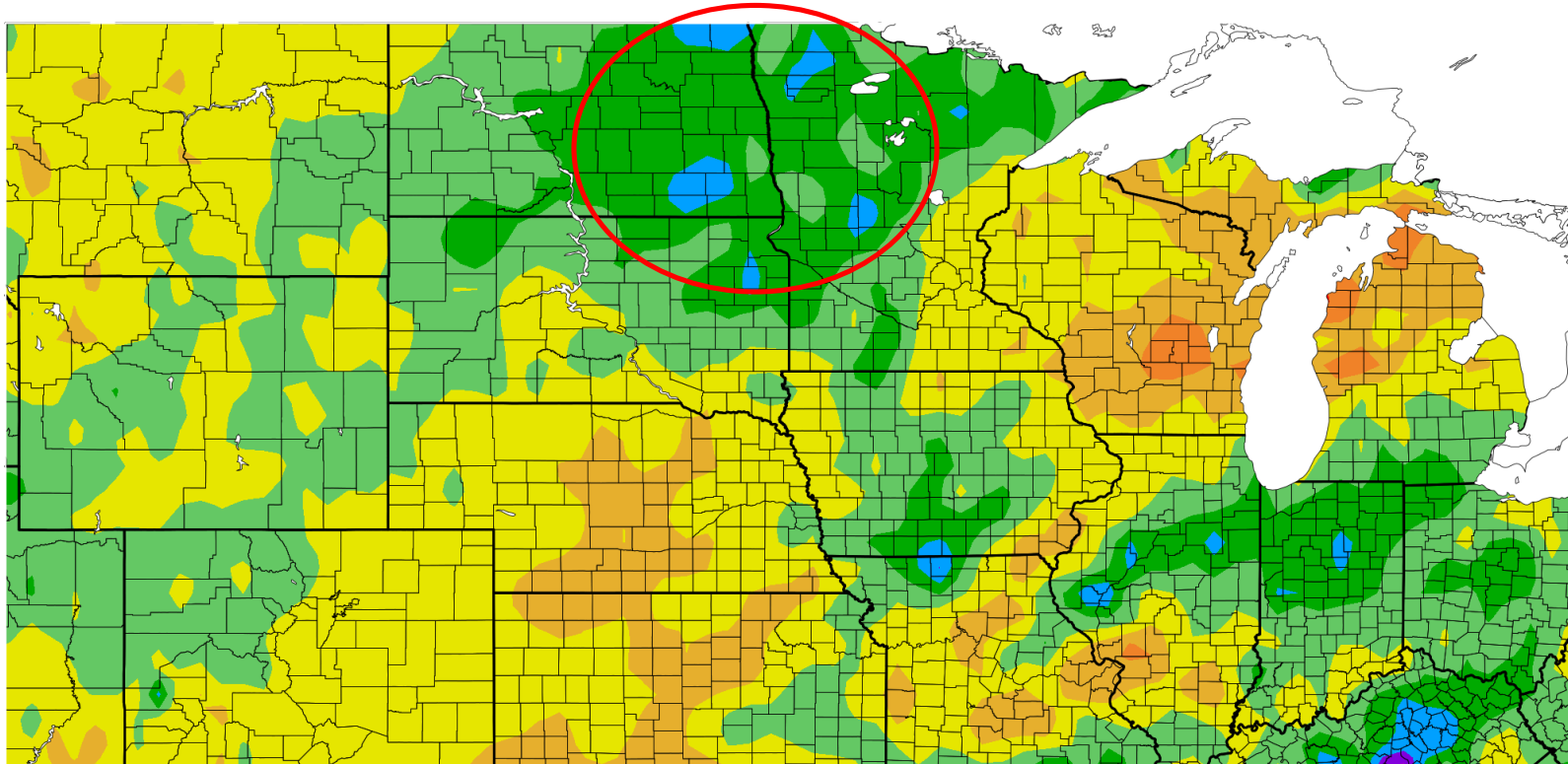
droughtmonitor.unl.edu

February 8, 2022

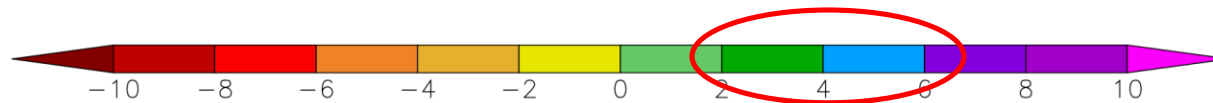


Fall-Winter Precipitation

Departure from Normal Precipitation (in)
10/1/2021 – 2/8/2022



3-6 inches more Fall-Winter precipitation (so far) compared to last year



Generated 2/9/2022 at HPRCC using provisional data.

NOAA Regional Climate Centers

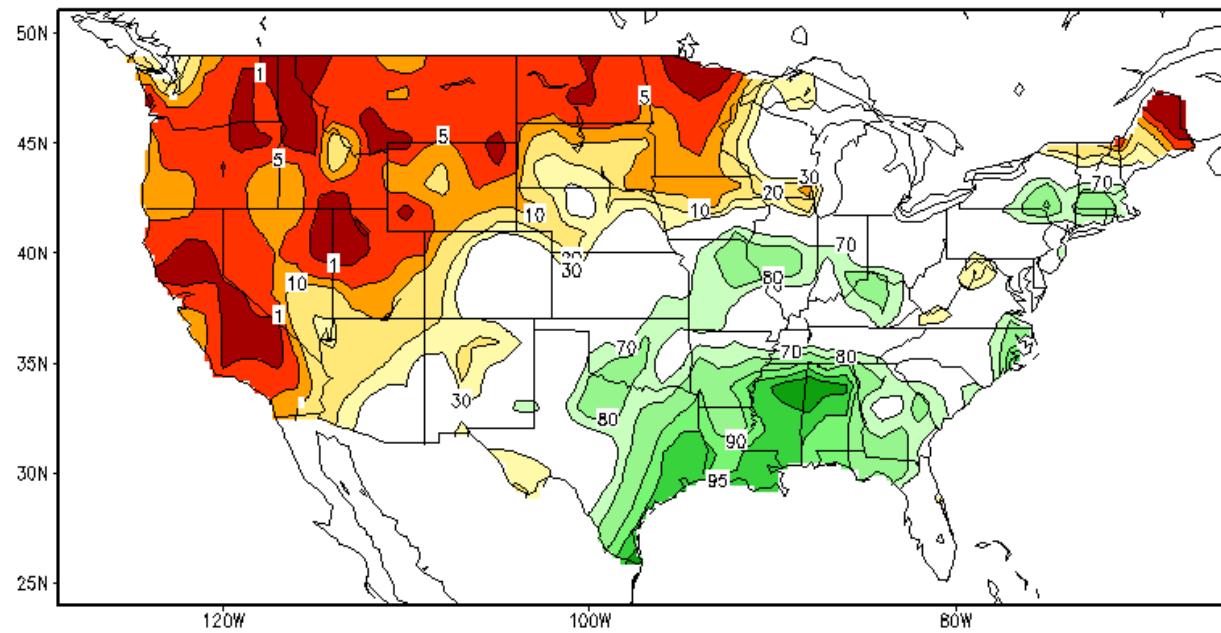
Summer vs Winter Soil Moisture

6 Months Ago (July 2021)

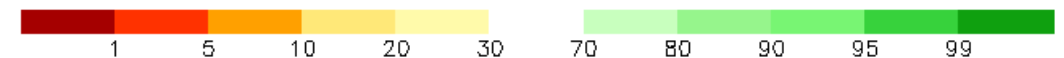
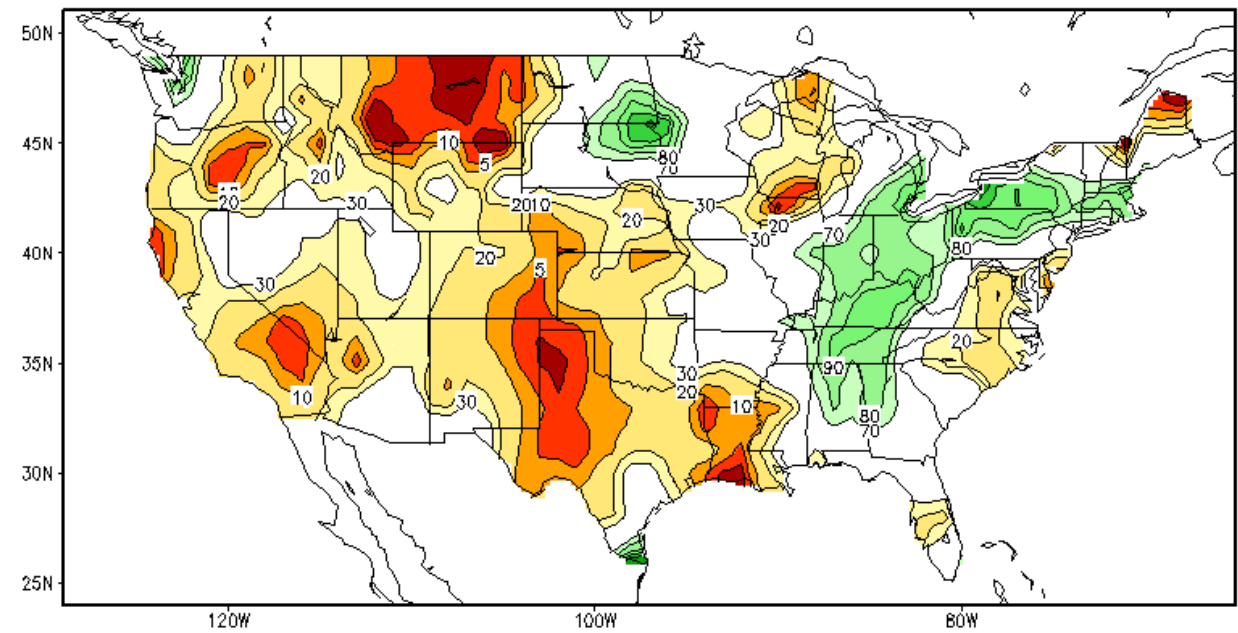
vs

Few Days Ago (February 2022)

Calculated Soil Moisture Ranking Percentile
JUL, 2021

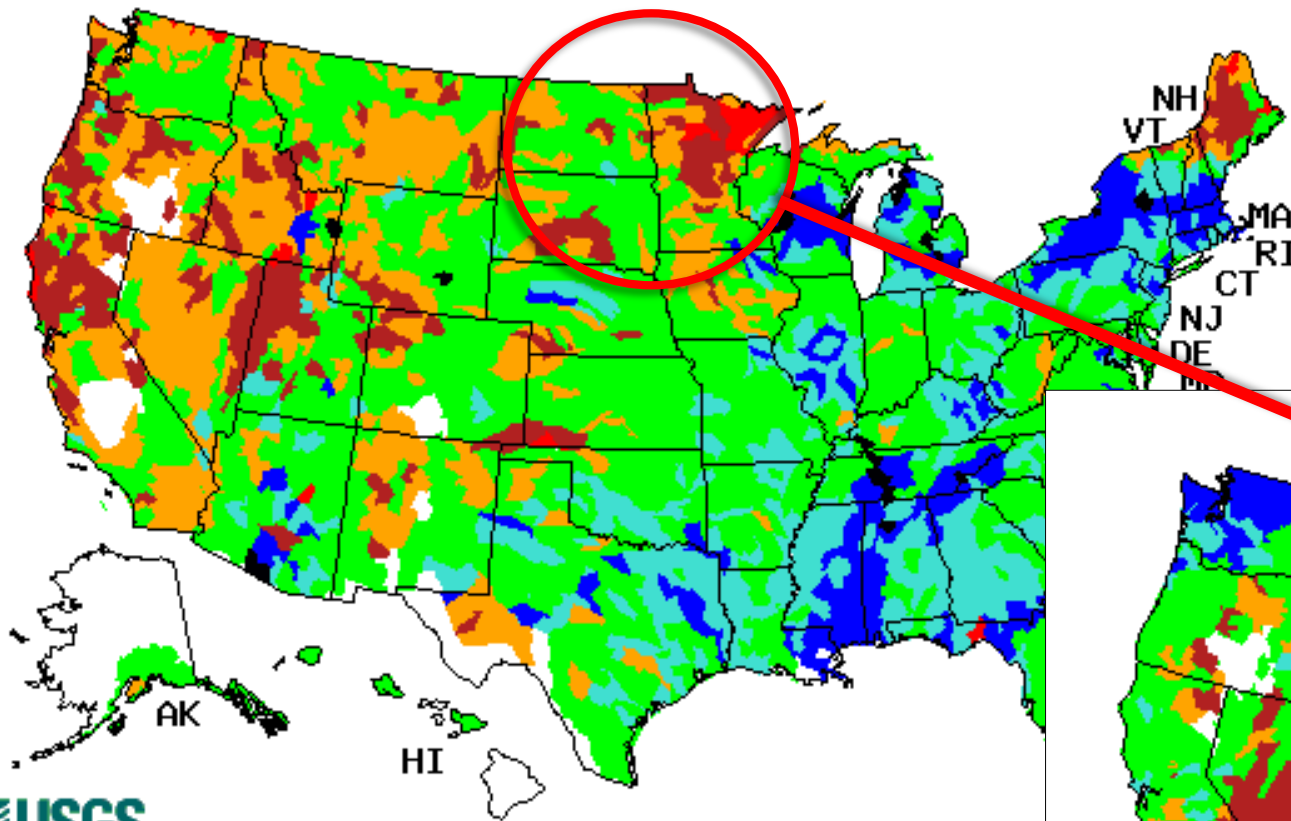


Calculated Soil Moisture Ranking Percentile
FEB 08, 2022



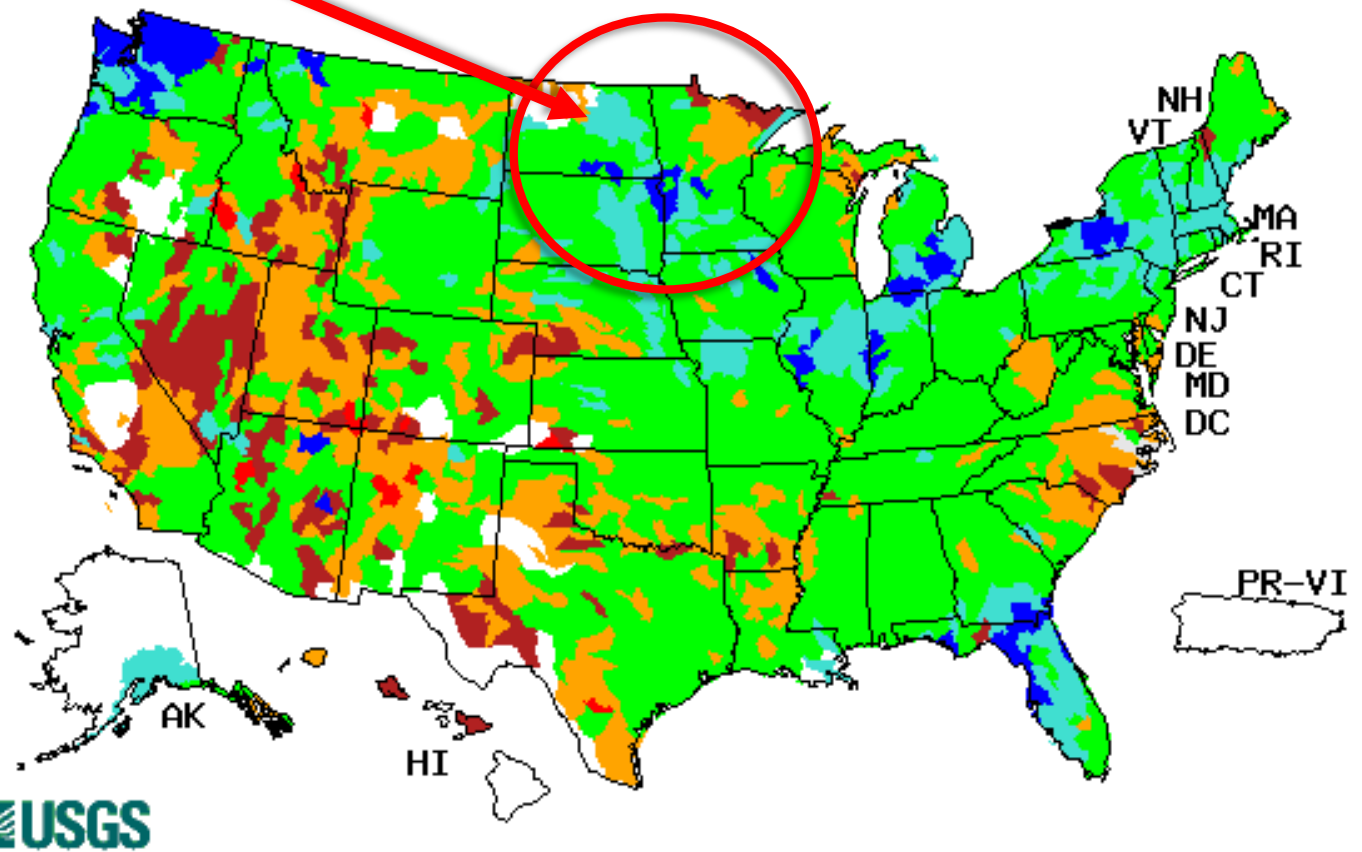
Current NWS/CPC analysis has the basin within +/- 1 inch of normal in top ~3 ft of soil

August 2021



**Much needed fall rains led to
near normal streamflow
heading into freeze-up**

November 2021

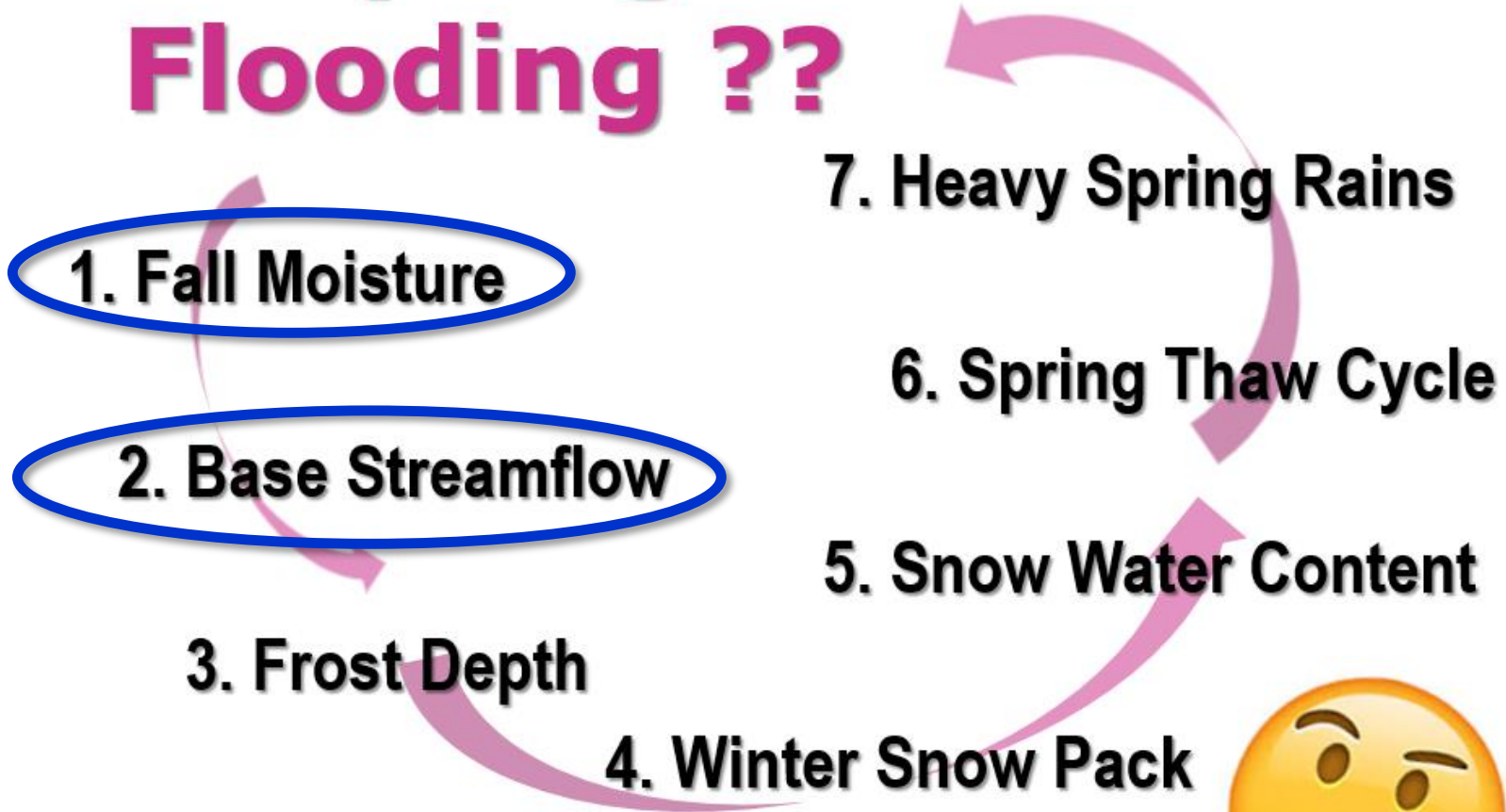


Explanation - Percentile classes

| | | | | | | |
|-----|-------------------|--------------|--------|--------------|-------------------|------|
| | | | | | | |
| Low | <10 | 10-24 | 25-75 | 76-90 | >90 | High |
| | Much below normal | Below normal | Normal | Above normal | Much above normal | |

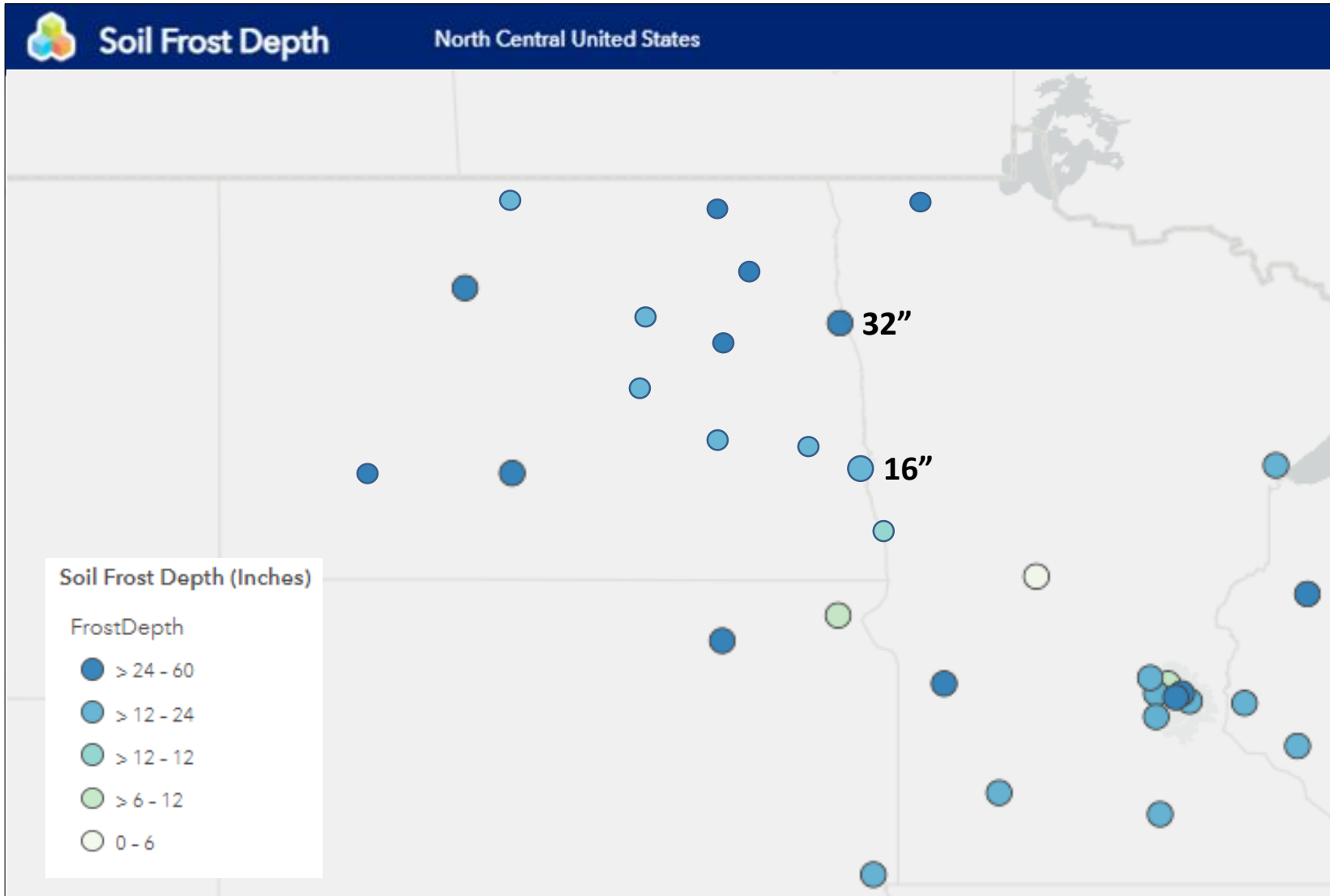
Red River Basin Spring Flood Ingredients

Spring Flooding ??



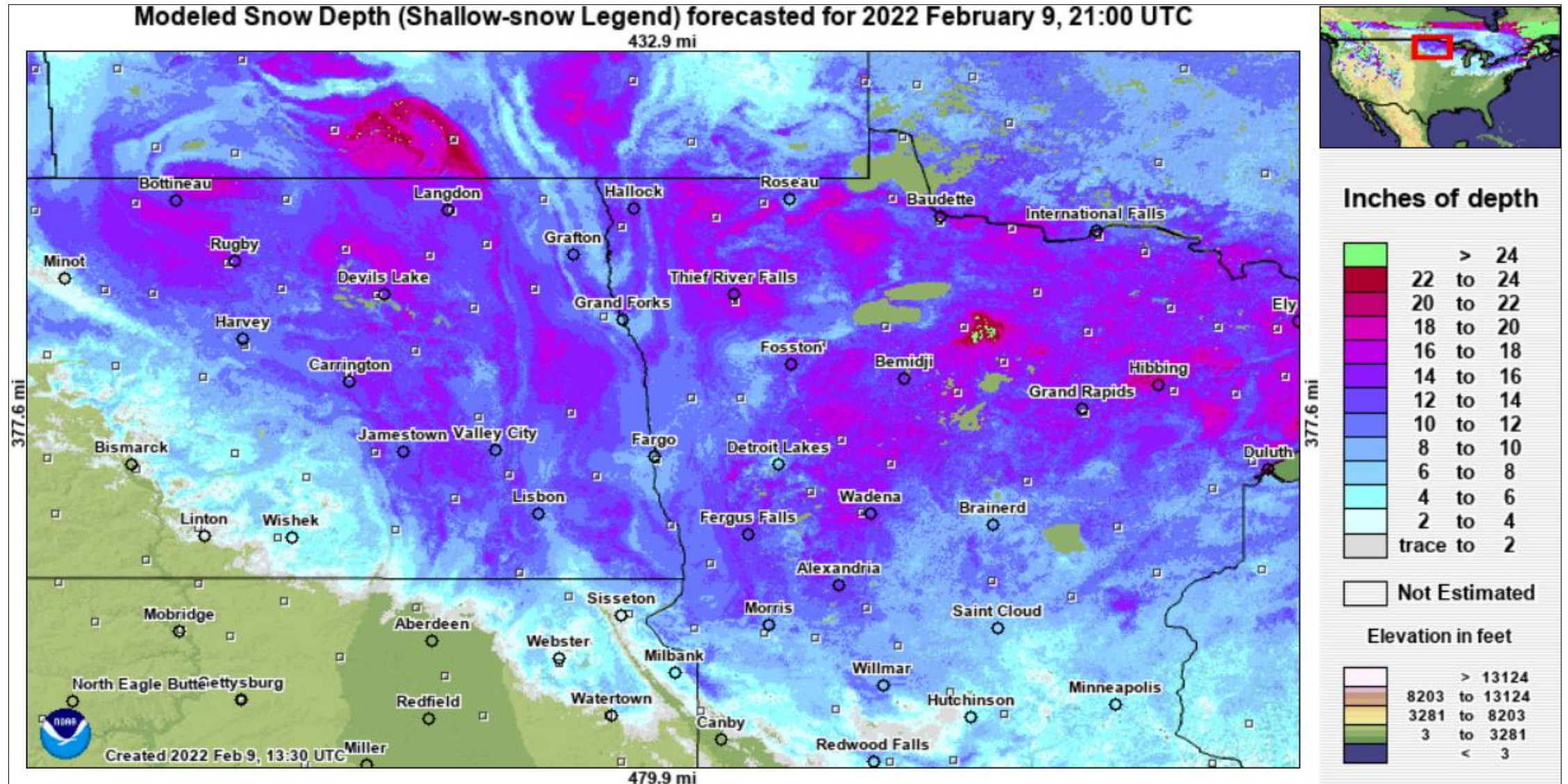
[Bluemle: Factors affecting flooding in the Red River Valley, 1997]

Frost Depths: Near to Deeper than Normal



- Despite the relatively warm start to winter, frost has penetrated fairly deep due to cold January and early February conditions
- Normal to slightly deeper than normal
 - Generally 12-40 inches
 - Note quite as deep in the far southern valley

Snow Depth: Near to above Normal



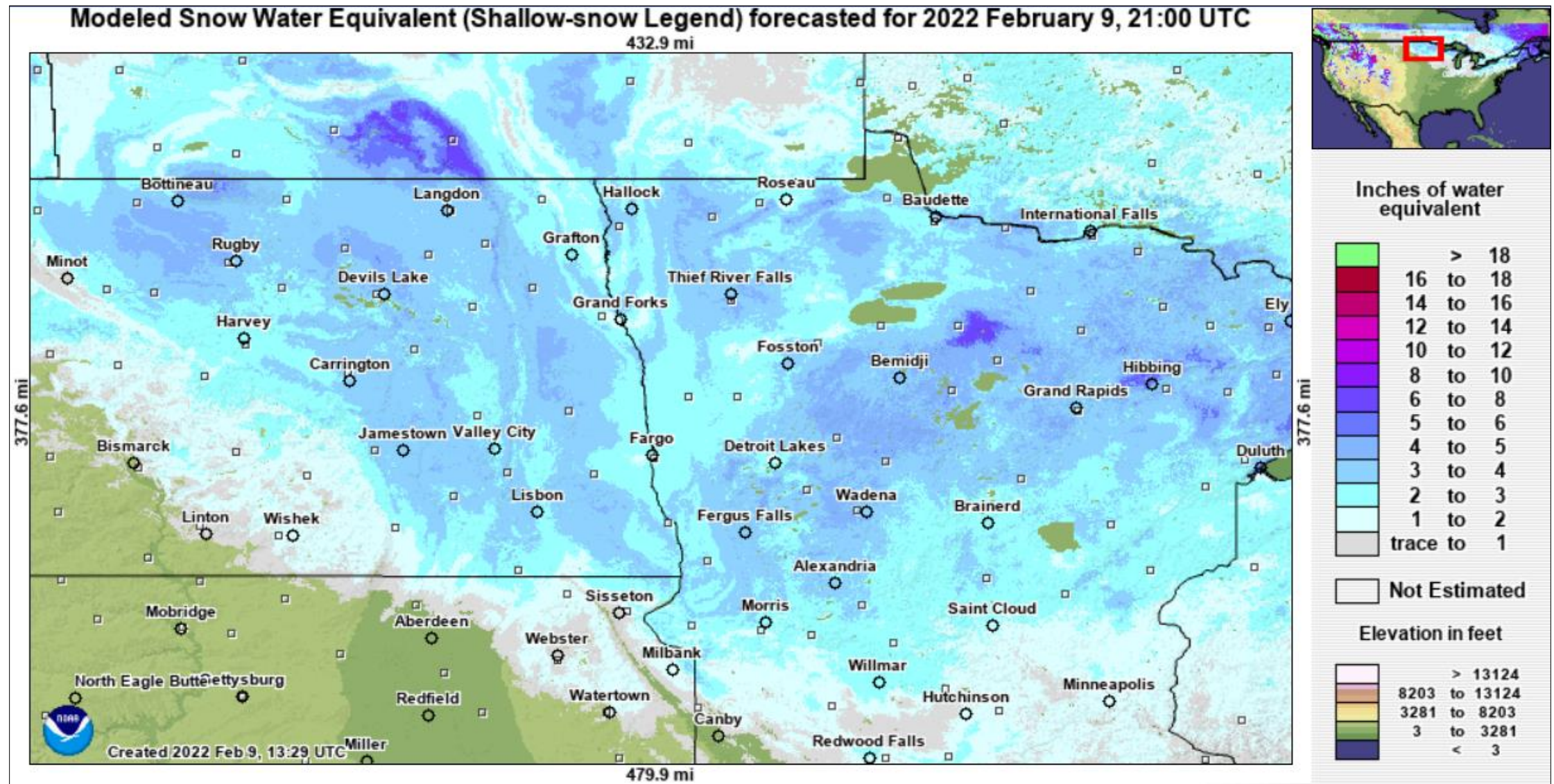
Roughly 6-20" across the basin

NWS Grand Forks: 12"

Fargo Observer: 8"

Data courtesy of NOHRSC

Snow Water Content: Near to above Normal



Roughly 2-4" across the basin

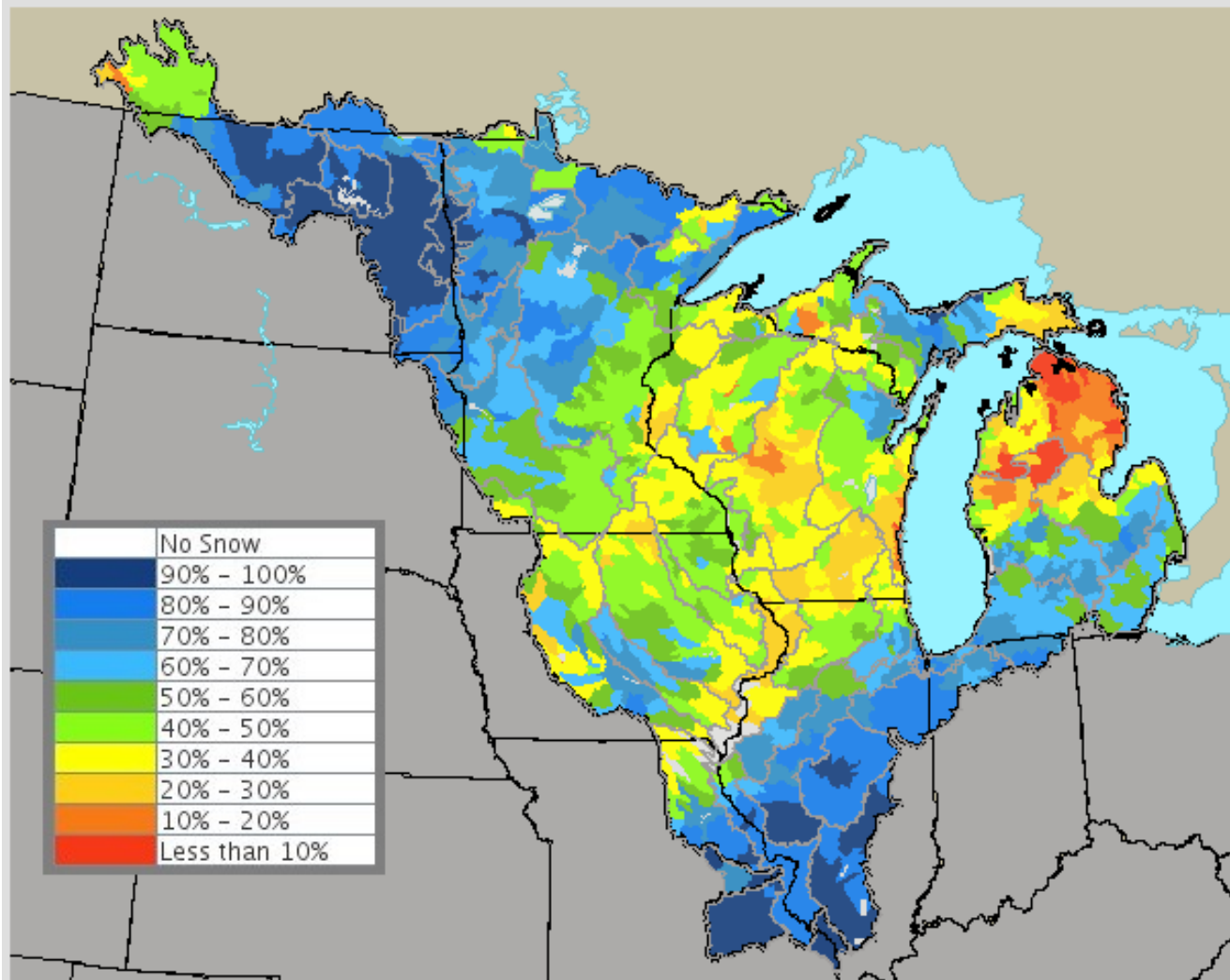
NWS Grand Forks: 3.3"

Fargo Observer: 1.9"

Data courtesy of NOHRSC



North Central River Forecast Center
Ranked Simulated Snow Water Equivalent
Valid for 02/07/2022 12 GMT



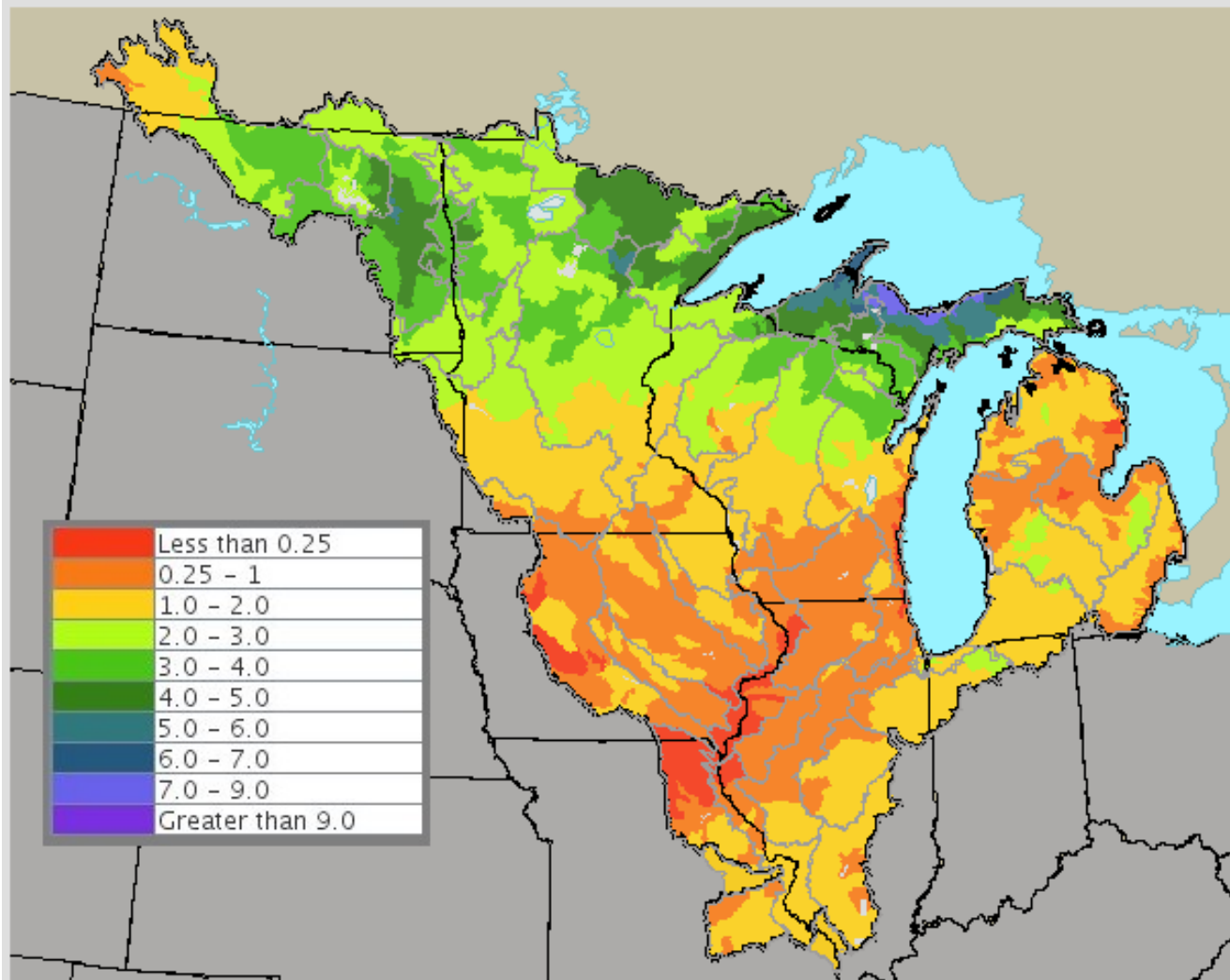
Note: This map compares current NCRFC Modeled SWE with the historical record of modeled SWE for each basin. An area ranked as 'Less than 10 percent' is at the lower end of the record and one ranked near 100 percent is at the higher end. A 50 percent ranking indicates current SWE is in the middle of our historical record.

Created on 02/08/2022 at 01:07:15 AM CST

- **Simulated/modeled Snow Water Content (as of 2/7) compared to historical record**
 - **Generally 60-90% across northwestern MN**
 - **90-100% across eastern ND and much of Red River mainstem**



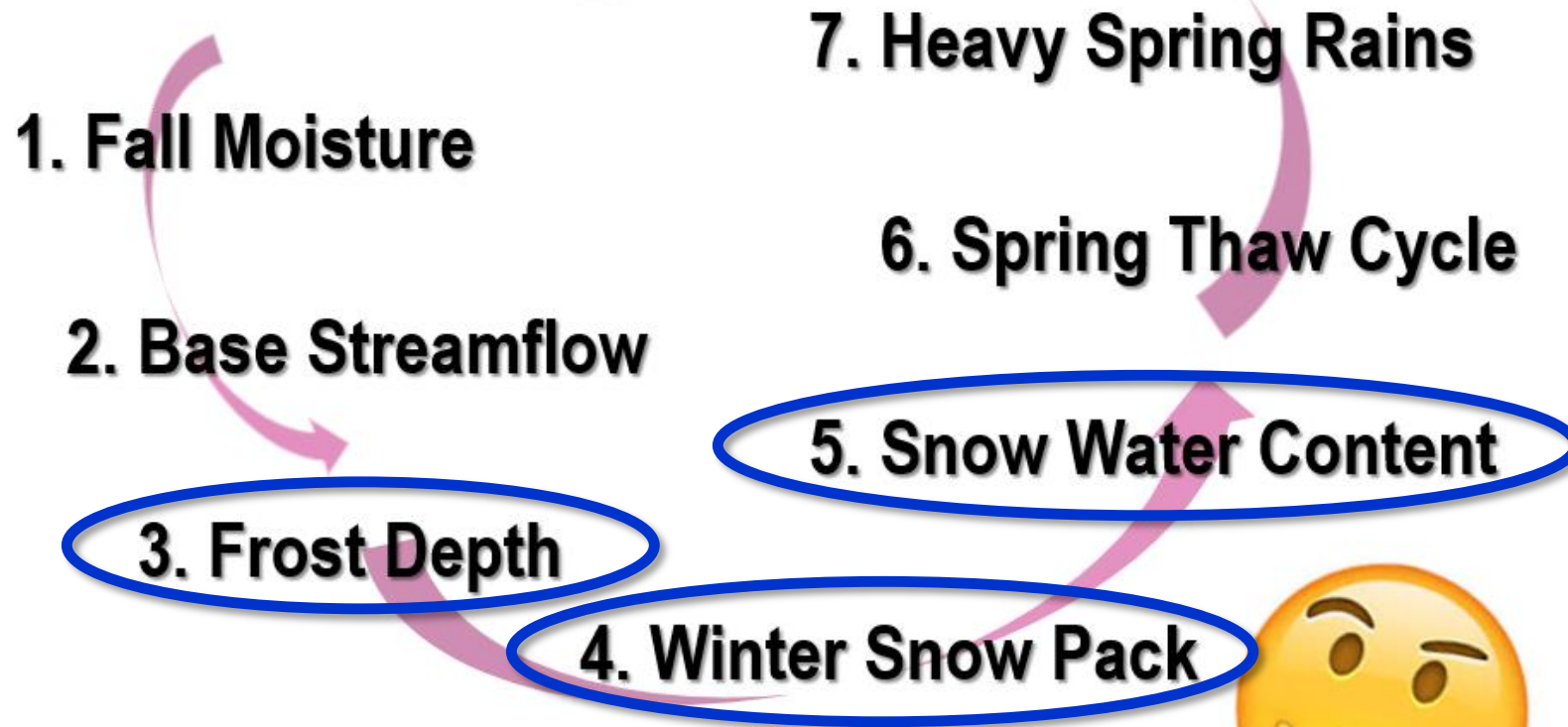
North Central River Forecast Center
Model Simulated Snow Water Equivalent
Valid for 02/07/2022 12 GMT



- Simulated/modeled Snow Water Content values (as of 2/7)
 - Generally 2-4 inches across northwestern MN
 - More 2-5 inches across eastern ND and Red River mainstem

Red River Basin Spring Flood Ingredients

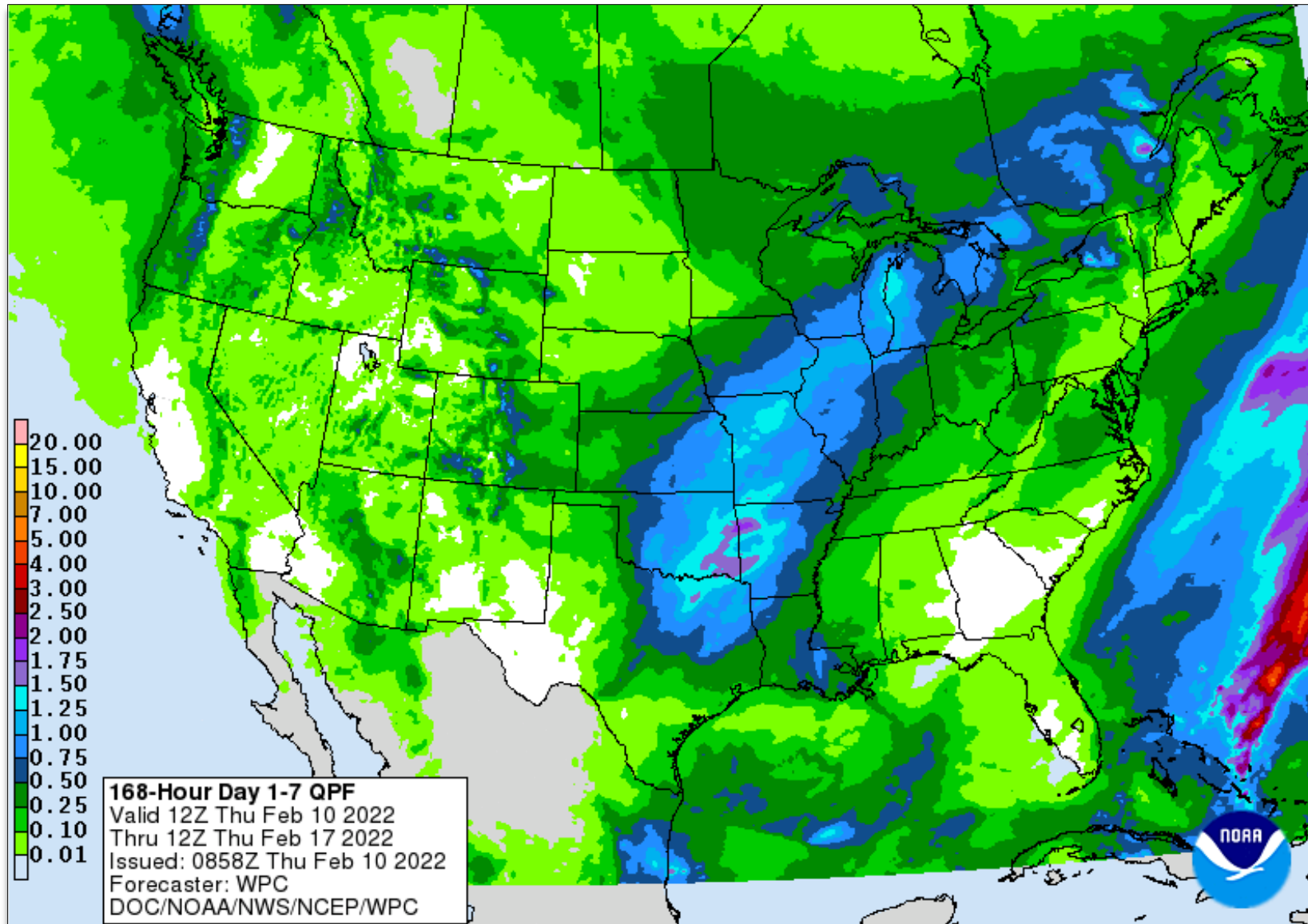
Spring Flooding ??



[Bluemle: Factors affecting flooding in the Red River Valley, 1997]



7-Day Forecast Precipitation Forecast (2/10-2/17)



CPC 8-14 Day Outlook



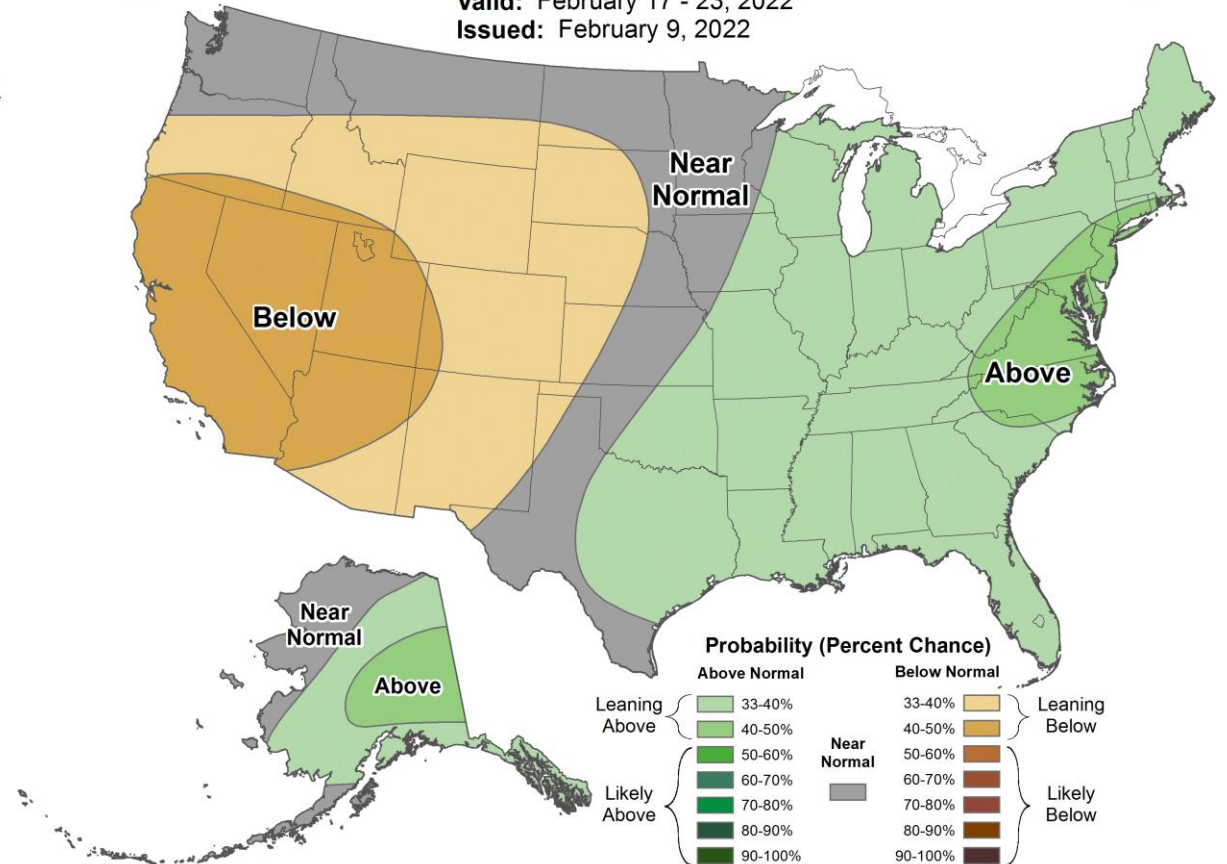
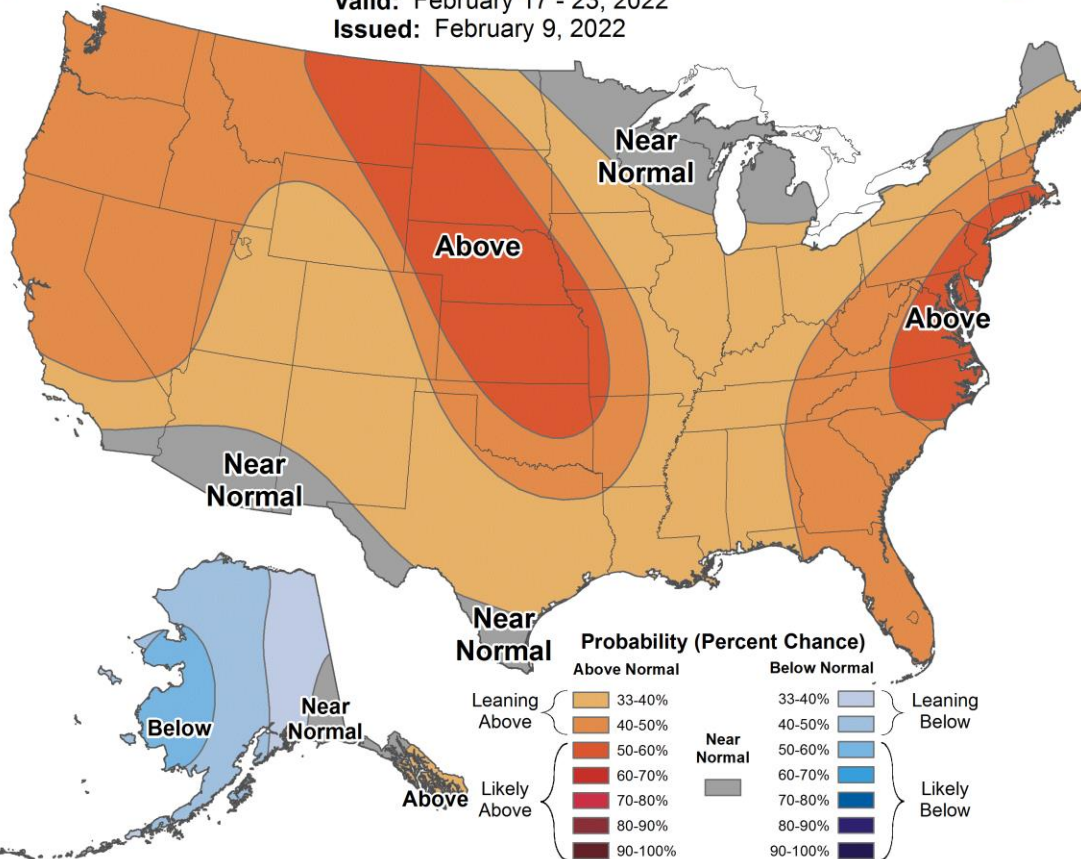
8-14 Day Temperature Outlook

Valid: February 17 - 23, 2022
Issued: February 9, 2022



8-14 Day Precipitation Outlook

Valid: February 17 - 23, 2022
Issued: February 9, 2022



Mid-February:

Increased chances for above normal temperatures with equal chances for below/normal/above precipitation

CPC Week 3-4 Outlook



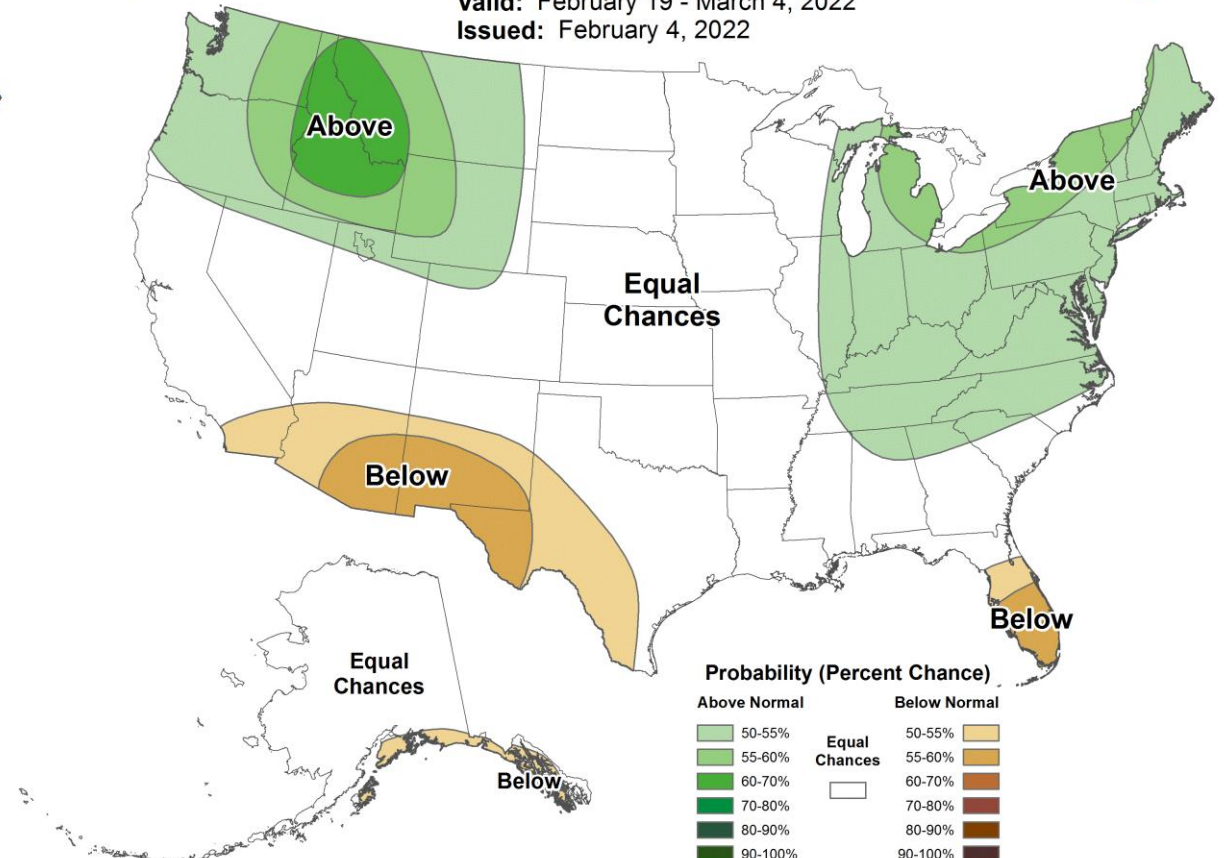
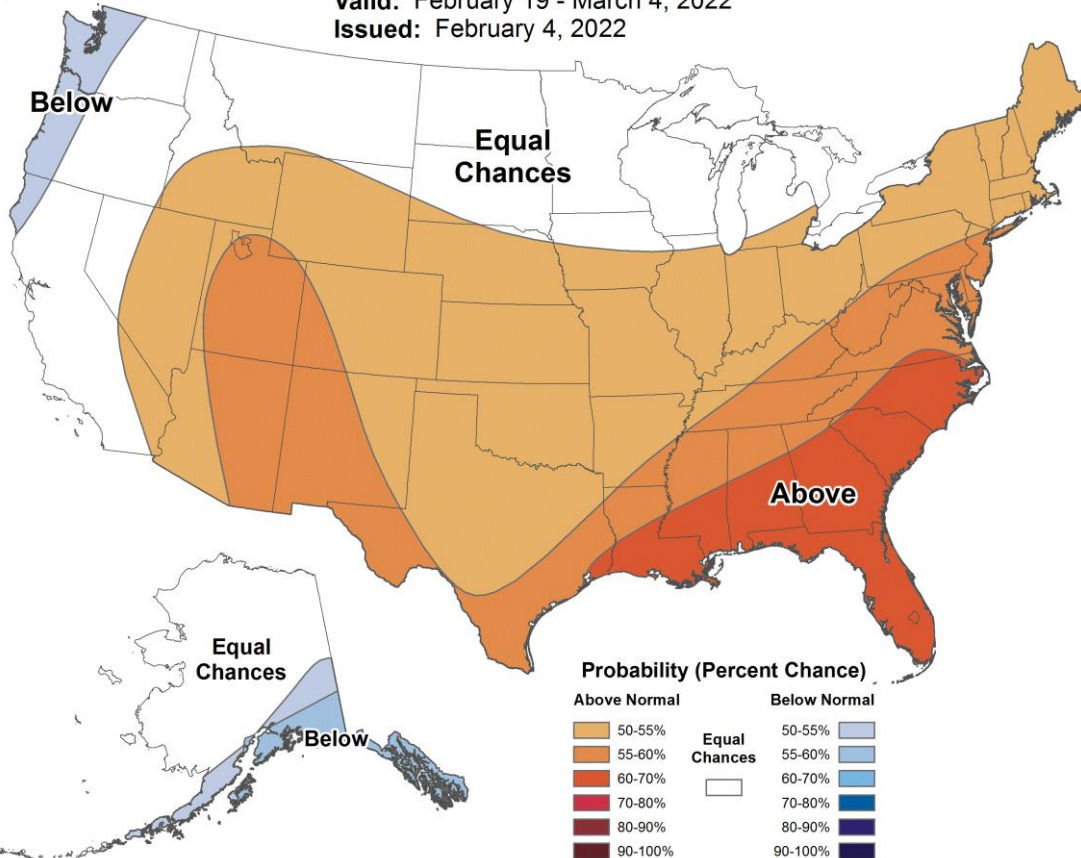
Weeks 3-4 Temperature Outlook

Valid: February 19 - March 4, 2022
Issued: February 4, 2022



Weeks 3-4 Precipitation Outlook

Valid: February 19 - March 4, 2022
Issued: February 4, 2022



End of February – Early March:

Equal chances for below/normal/above temperatures and precipitation.

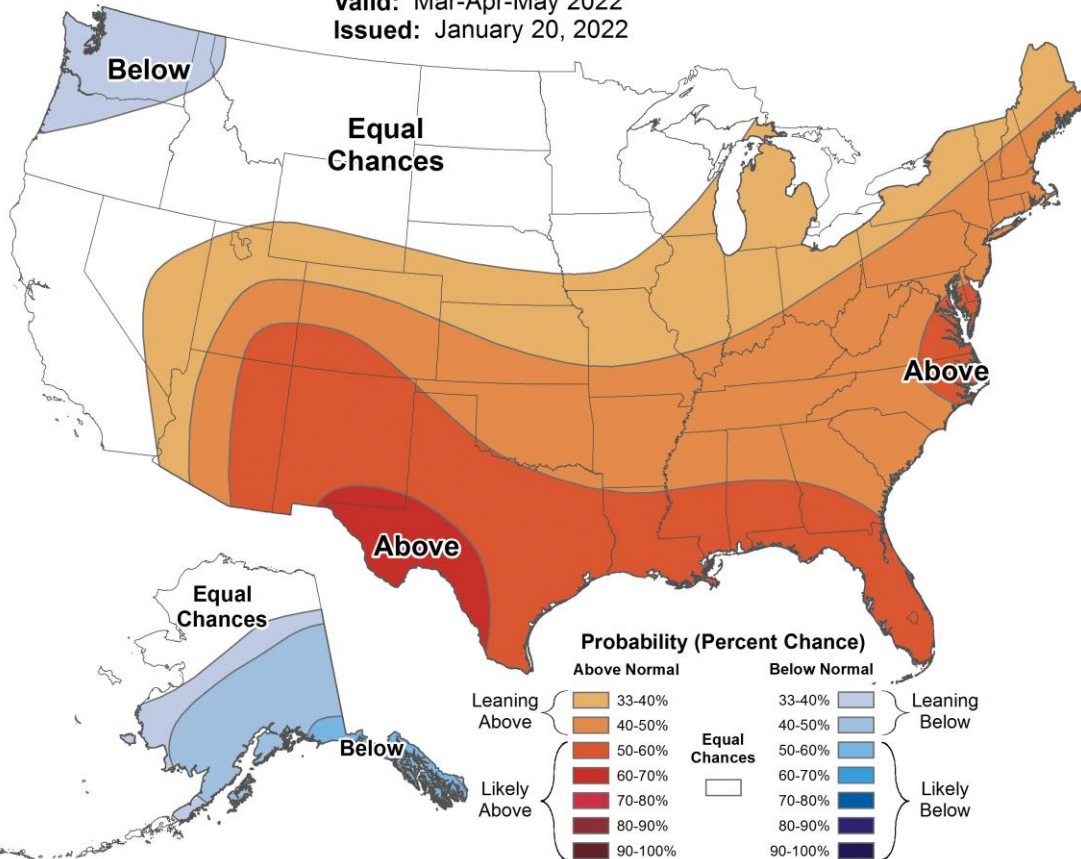
CPC March/April/May Outlook



Seasonal Temperature Outlook



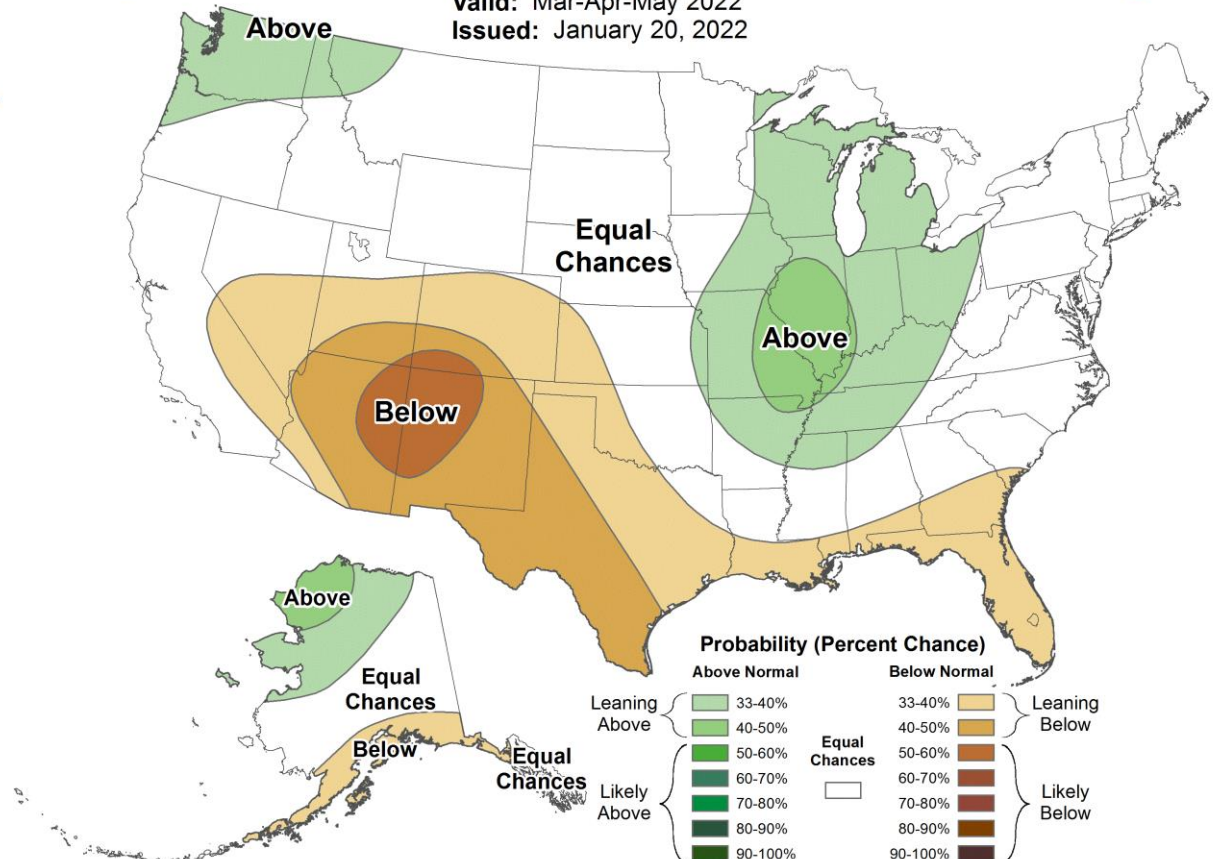
Valid: Mar-Apr-May 2022
Issued: January 20, 2022



Seasonal Precipitation Outlook

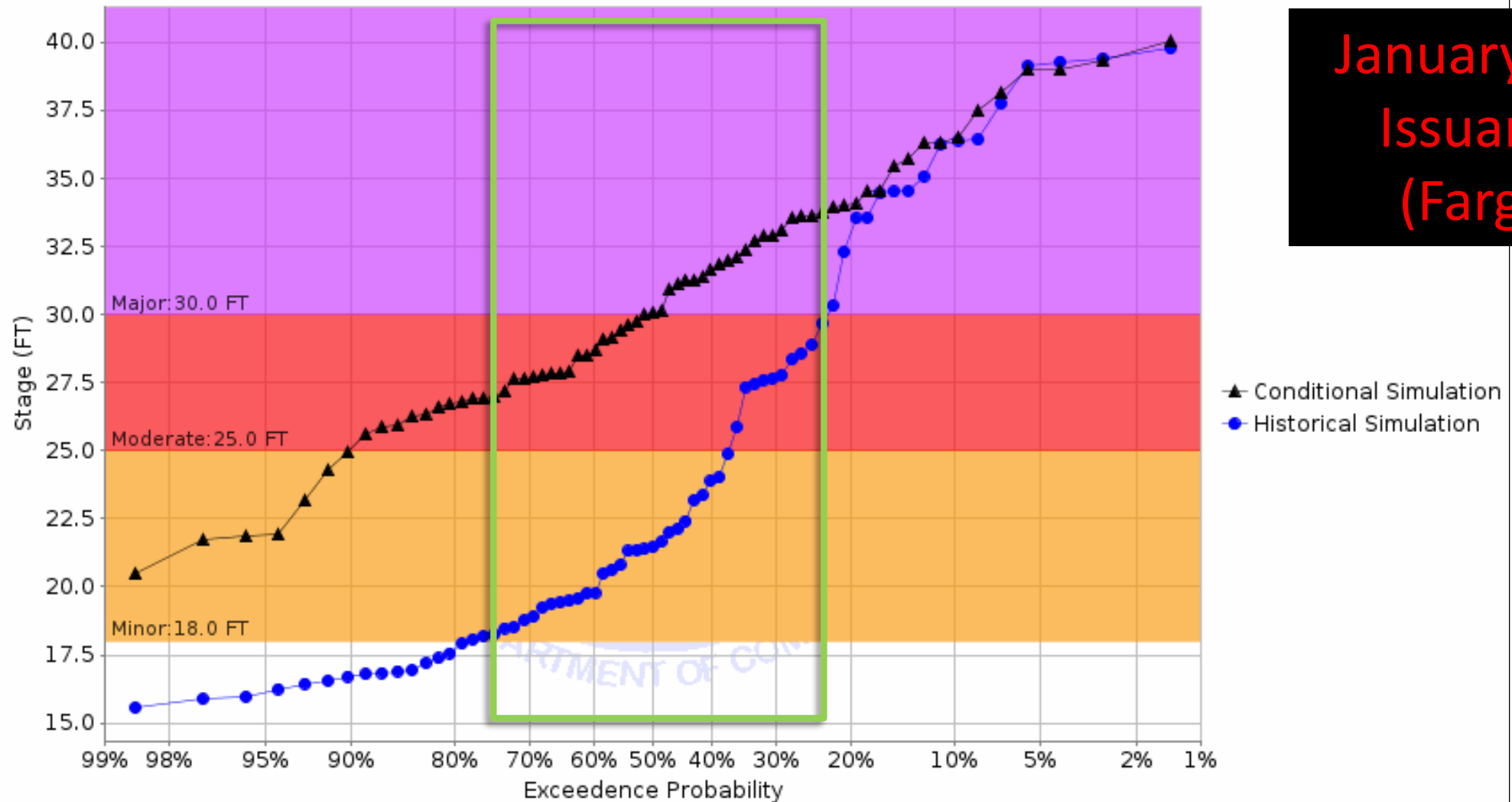


Valid: Mar-Apr-May 2022
Issued: January 20, 2022



Equal chances for below/normal/above temperatures and below/normal/above precipitation (i.e., no strong signal either way).

Chance of Exceeding River Stage at Red River of the North at Fargo WTP (FGON8)
Forecast for the period 01/31/2022 - 05/01/2022
This is a conditional simulation based on the conditions as of 01/24/2022

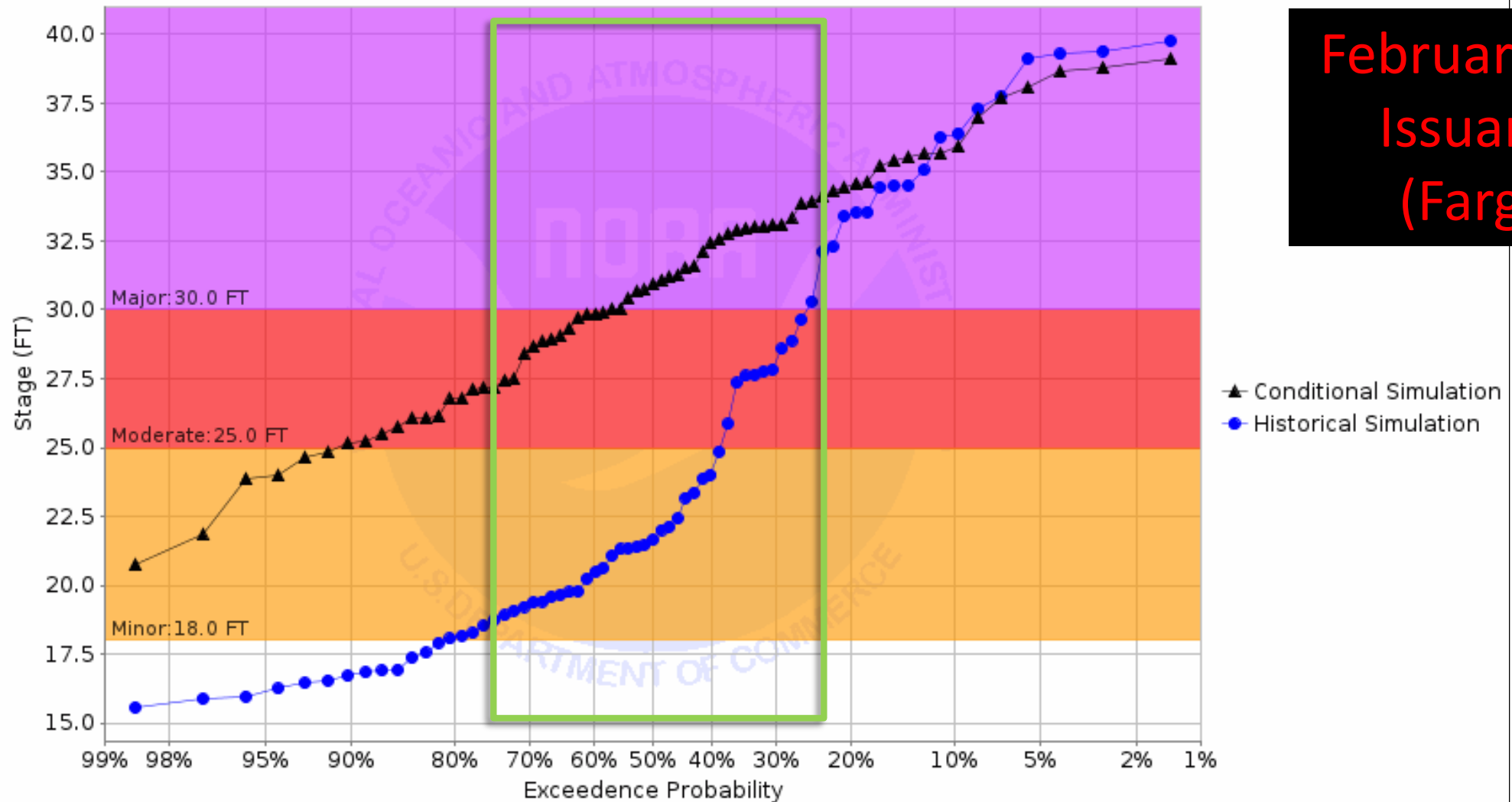


January 27th
Issuance
(Fargo)

With **near normal temperatures and precipitation** through the rest of winter and into spring,
moderate to **low end major** flooding is probable for **Fargo/Moorhead**.

(Not taking into account precipitation type or melt rate.)

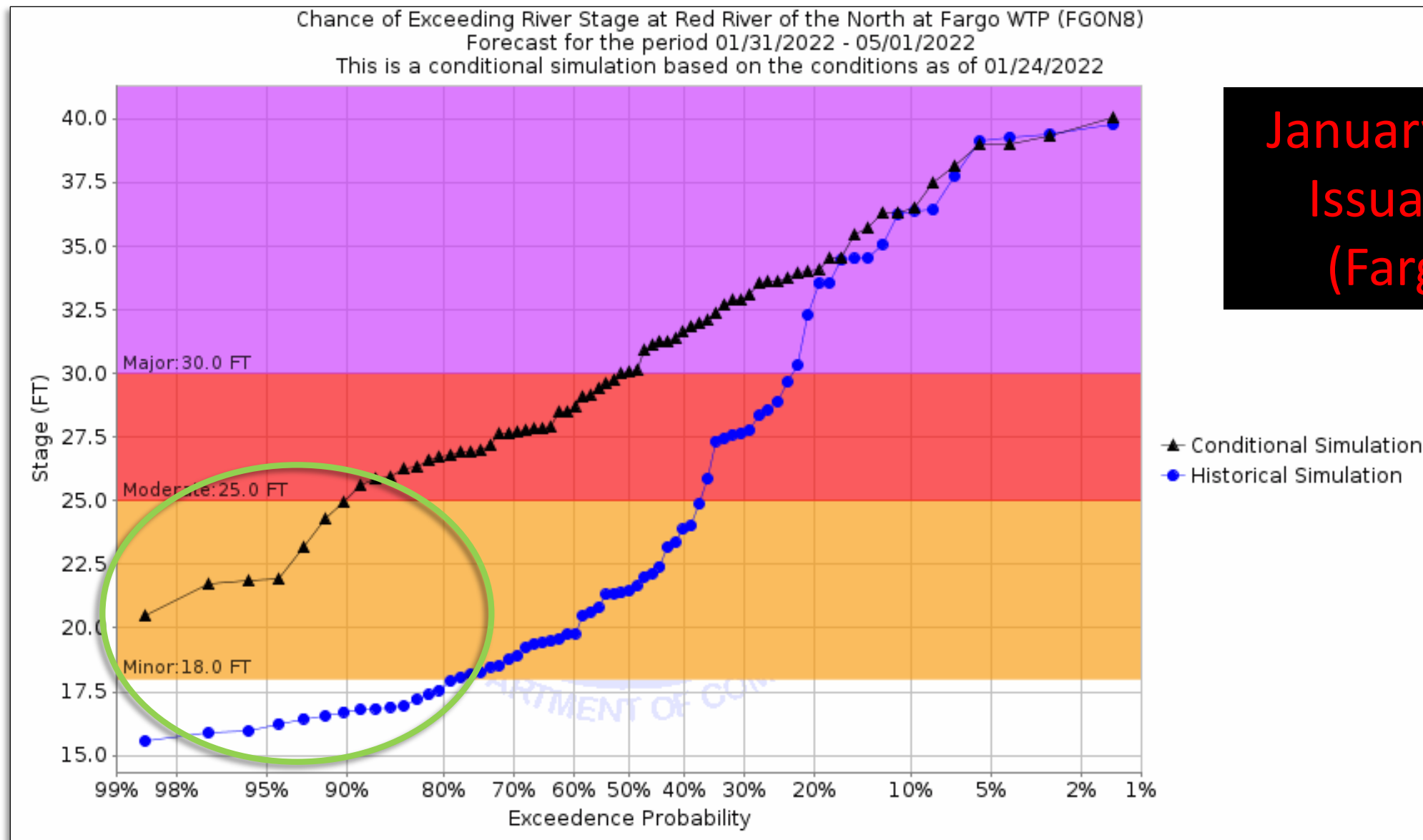
Chance of Exceeding River Stage at Red River of the North at Fargo WTP (FGON8)
Forecast for the period 02/14/2022 - 05/15/2022
This is a conditional simulation based on the conditions as of 02/07/2022



February 10th
Issuance
(Fargo)

With **near normal temperatures and precipitation** through the rest of winter and into spring,
moderate to **low end major** flooding is probable for **Fargo/Moorhead**.

(Not taking into account precipitation type or melt rate.)

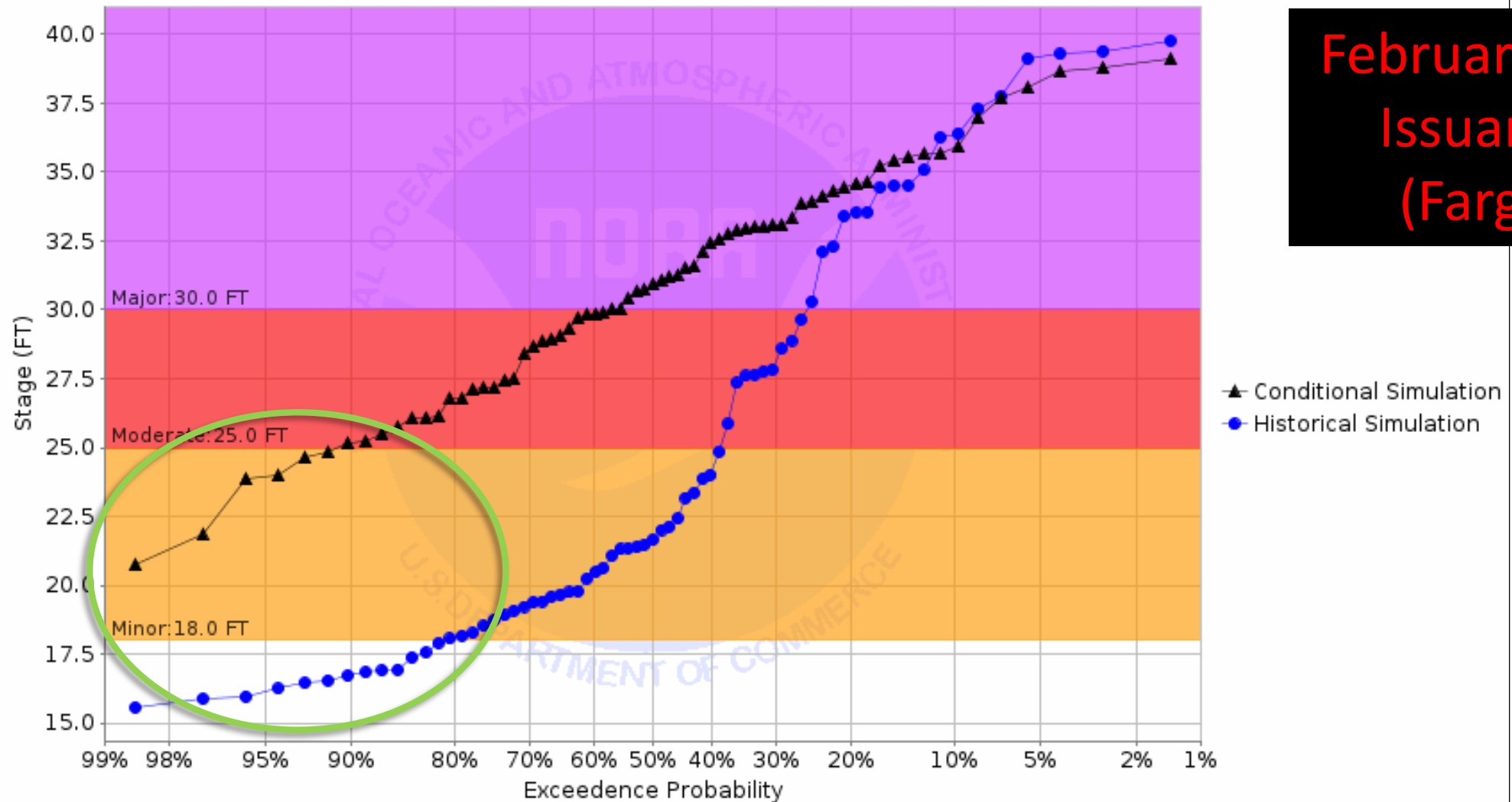


January 27th
Issuance
(Fargo)

With **mild conditions and little to no additional precipitation** through the rest of winter and into spring, **minor** flooding is probable for **Fargo/Moorhead**.

(Not taking into account precipitation type or melt rate.)

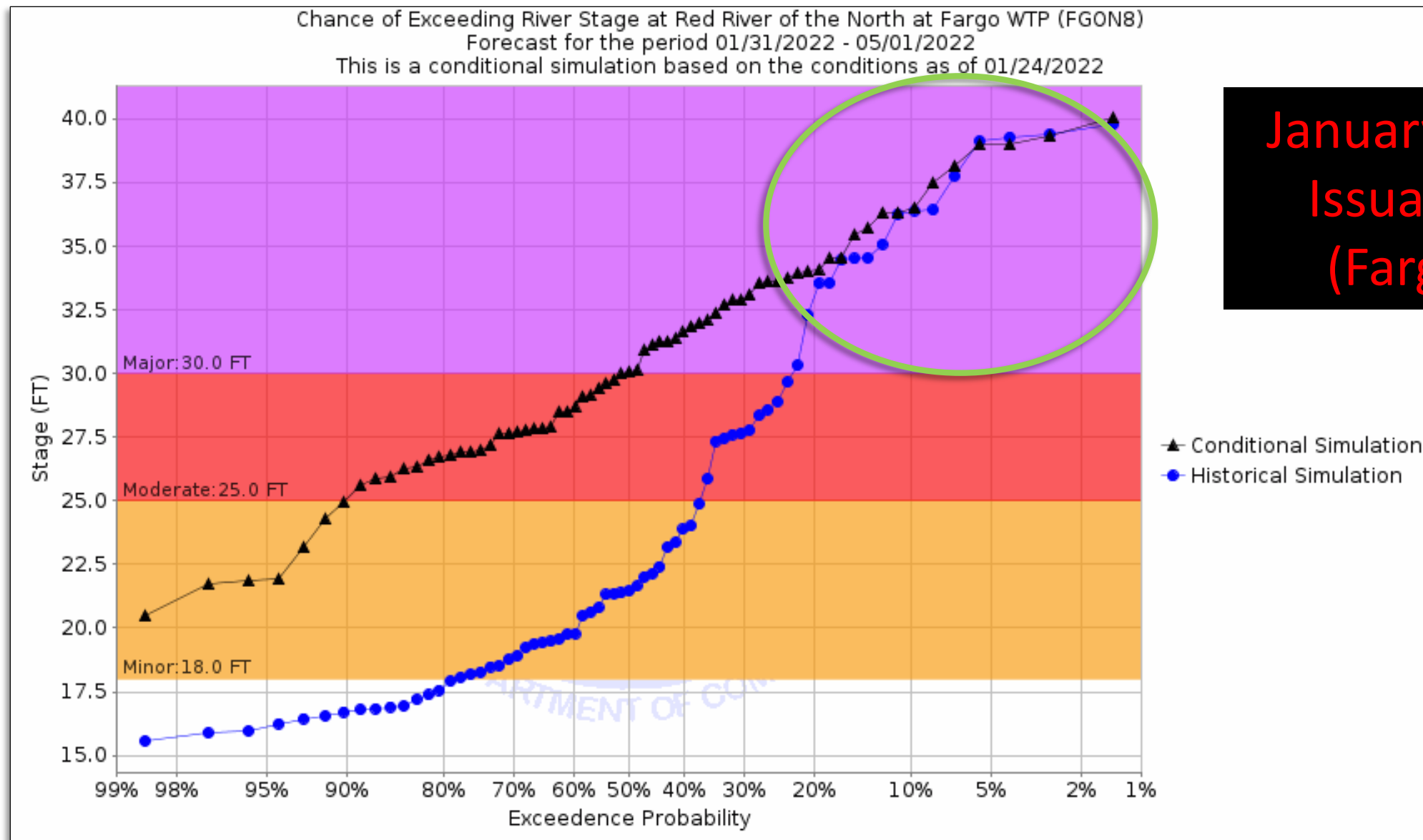
Chance of Exceeding River Stage at Red River of the North at Fargo WTP (FGON8)
Forecast for the period 02/14/2022 - 05/15/2022
This is a conditional simulation based on the conditions as of 02/07/2022



February 10th
Issuance
(Fargo)

With **mild conditions and little to no additional precipitation** through the rest of winter and into spring, **minor to moderate** flooding is probable for **Fargo/Moorhead**.

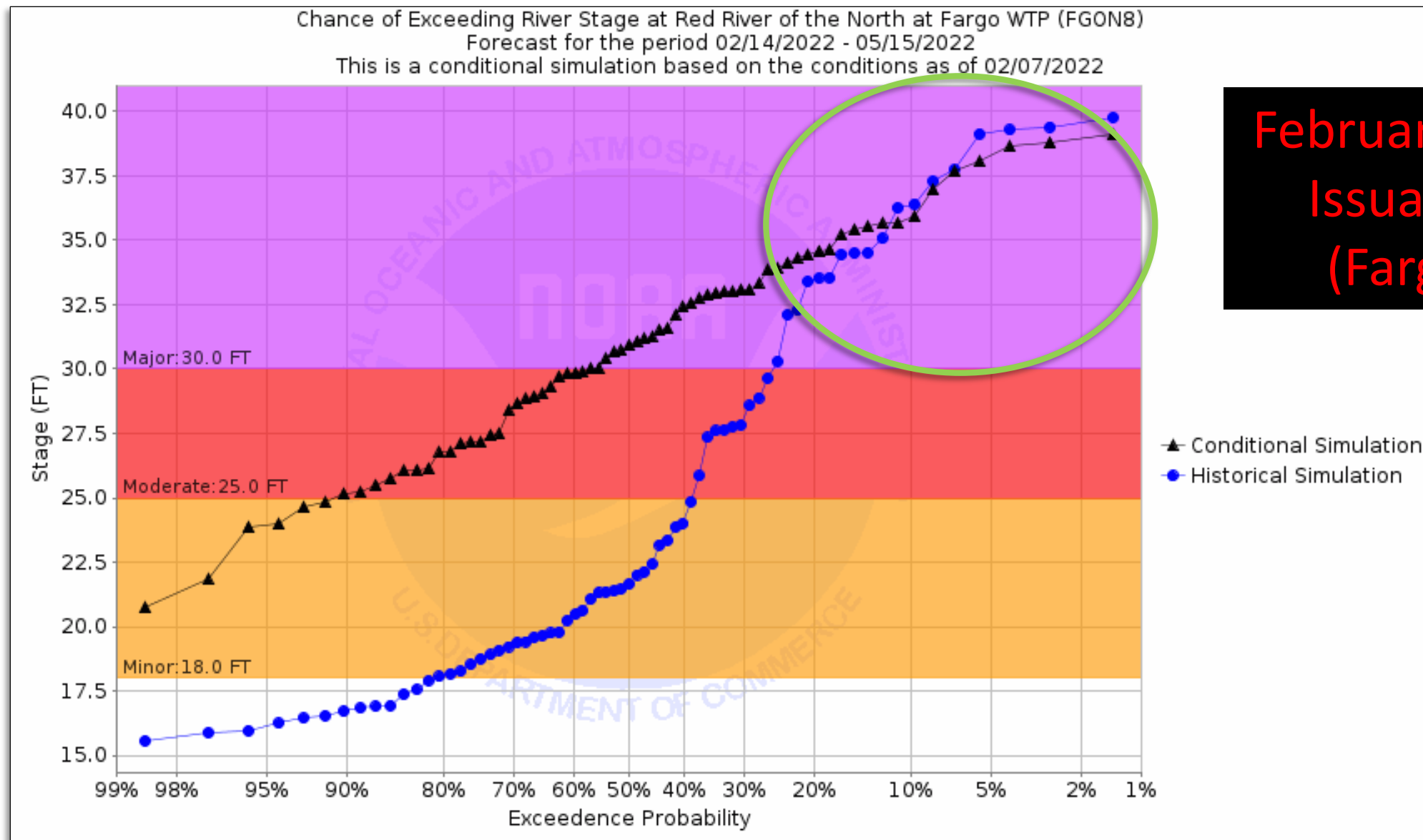
(Not taking into account precipitation type or melt rate.)



January 27th
Issuance
(Fargo)

With **cold conditions and significantly above normal precipitation** through the rest of winter and into spring, *major* flooding is probable for **Fargo/Moorhead**.

(Not taking into account precipitation type or melt rate.)

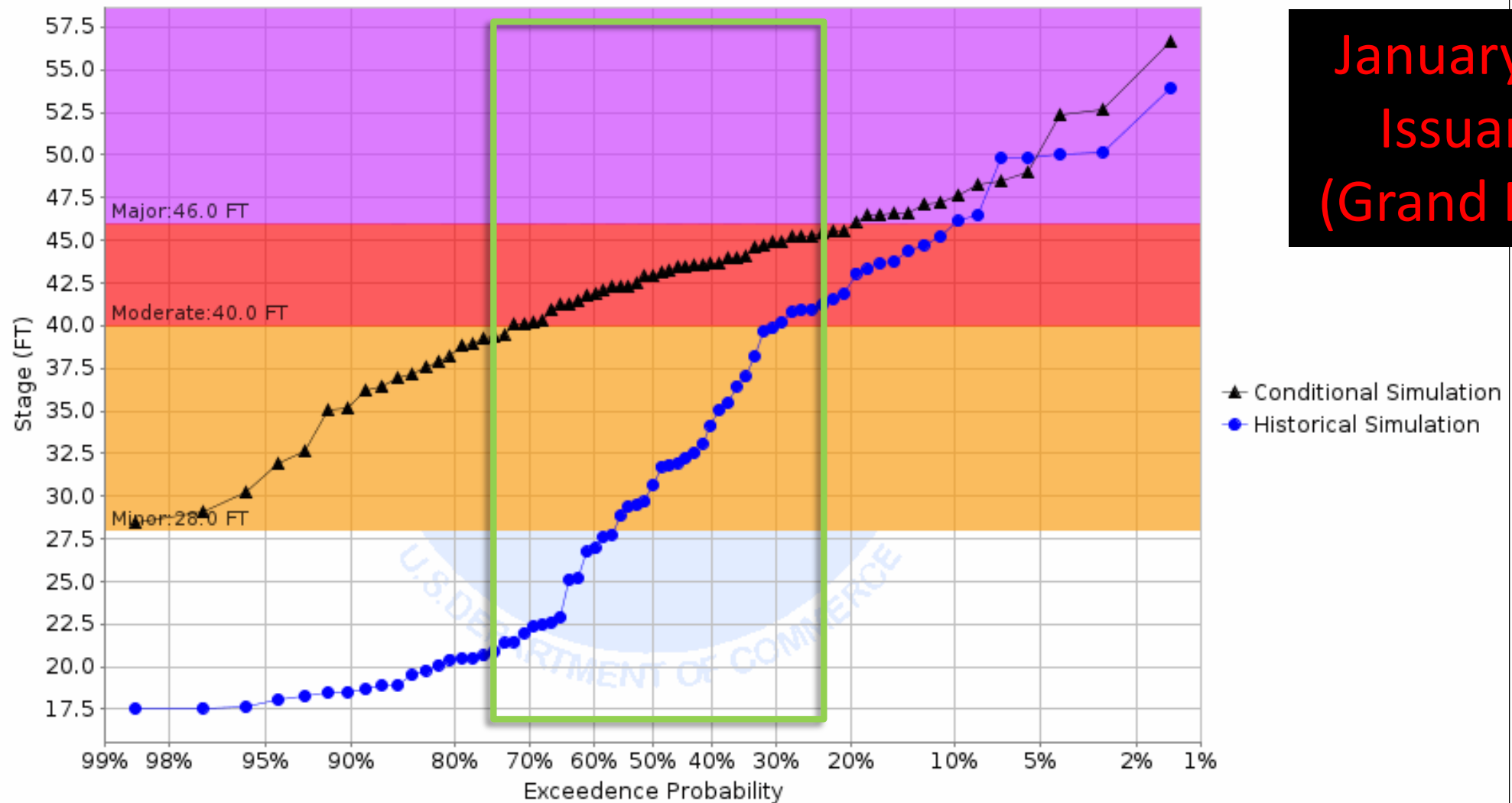


February 10th
Issuance
(Fargo)

With **cold conditions and significantly above normal precipitation** through the rest of winter and into spring, *major* flooding is probable for **Fargo/Moorhead**.

(Not taking into account precipitation type or melt rate.)

Chance of Exceeding River Stage at Red River of the North at East Grand Forks (EGFM5)
Forecast for the period 01/31/2022 - 05/01/2022
This is a conditional simulation based on the conditions as of 01/24/2022

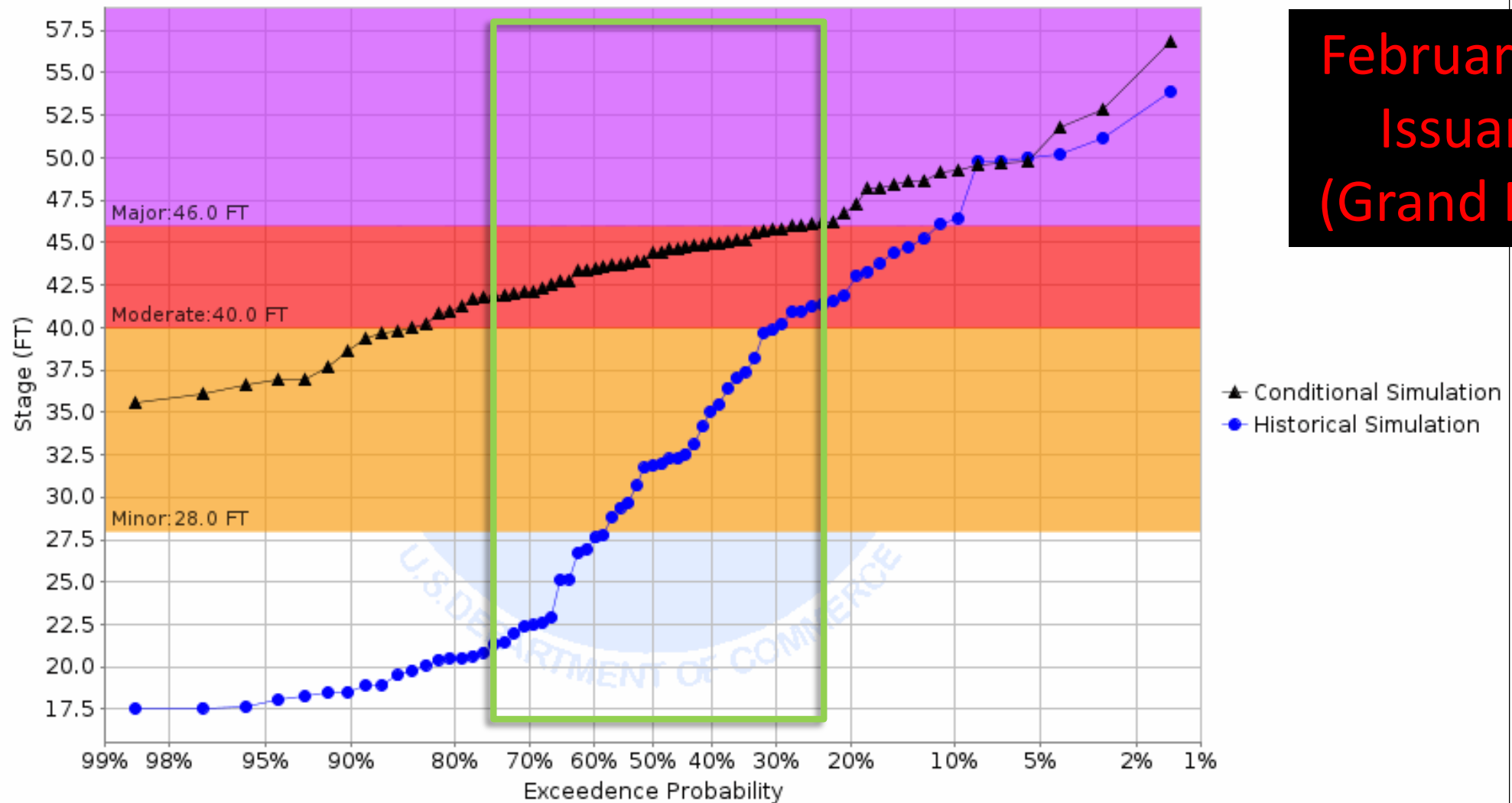


January 27th
Issuance
(Grand Forks)

With **near normal temperatures and precipitation** through the rest of winter and into spring,
moderate flooding is probable for **Grand Forks/East Grand Forks**.

(Not taking into account precipitation type or melt rate.)

Chance of Exceeding River Stage at Red River of the North at East Grand Forks (EGFM5)
Forecast for the period 02/14/2022 - 05/15/2022
This is a conditional simulation based on the conditions as of 02/07/2022

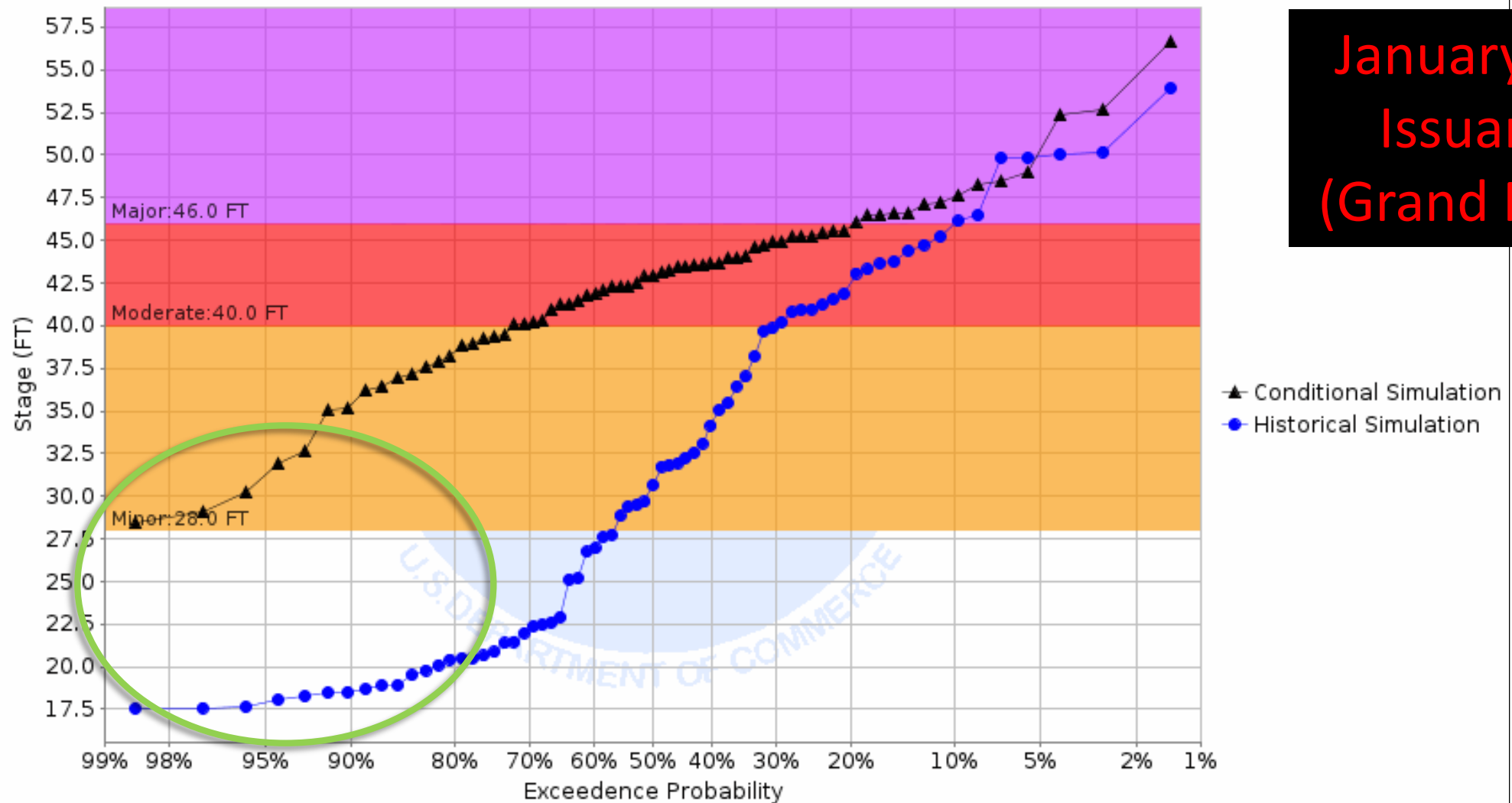


February 10th
Issuance
(Grand Forks)

With **near normal temperatures and precipitation** through the rest of winter and into spring, ***moderate*** flooding is probable for **Grand Forks/East Grand Forks**.

(Not taking into account precipitation type or melt rate.)

Chance of Exceeding River Stage at Red River of the North at East Grand Forks (EGFM5)
Forecast for the period 01/31/2022 - 05/01/2022
This is a conditional simulation based on the conditions as of 01/24/2022

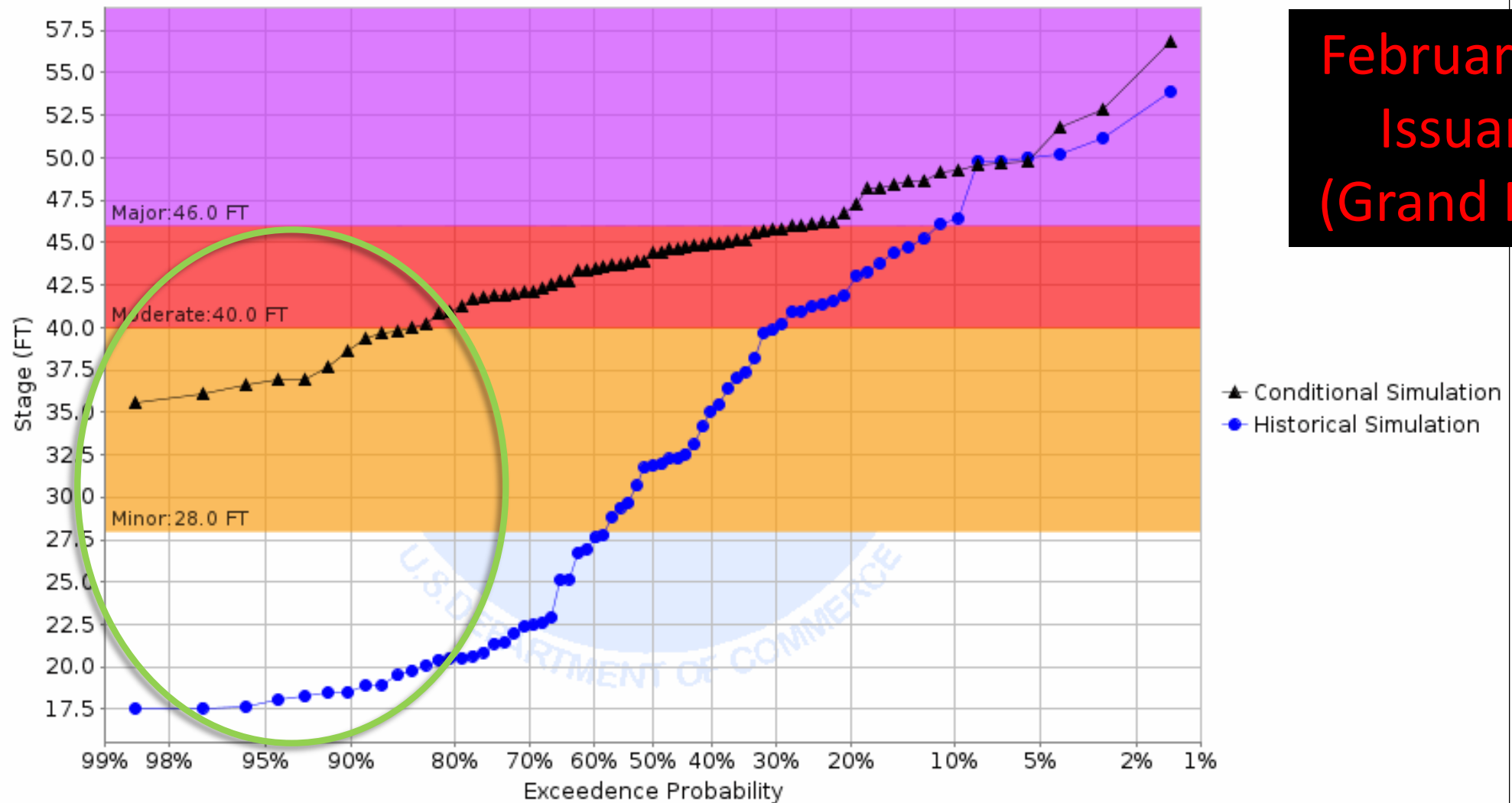


January 27th
Issuance
(Grand Forks)

With **mild conditions and little to no additional precipitation** through the rest of winter and into spring, **minor** flooding is probable for **Grand Forks/East Grand Forks**.

(Not taking into account precipitation type or melt rate.)

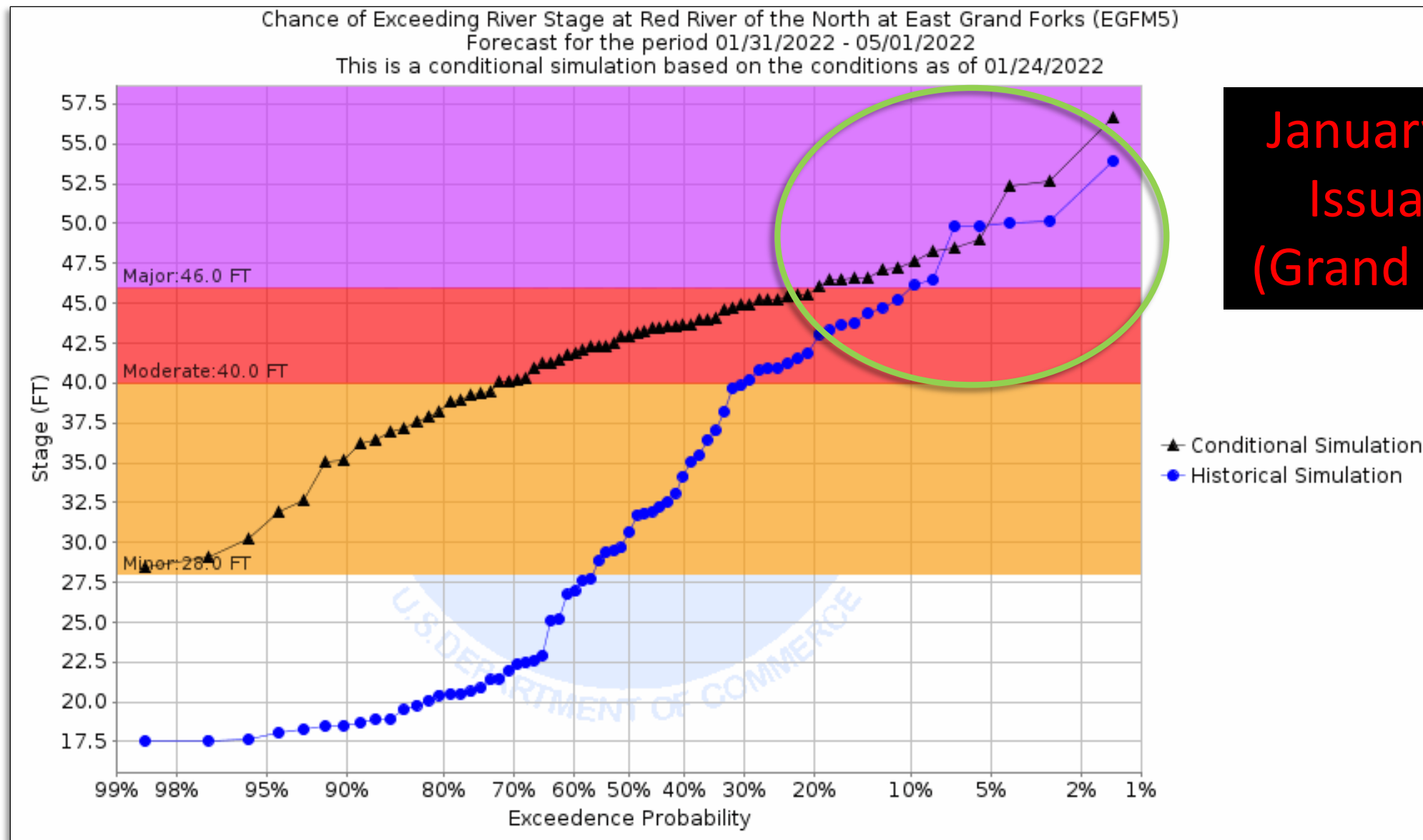
Chance of Exceeding River Stage at Red River of the North at East Grand Forks (EGFM5)
Forecast for the period 02/14/2022 - 05/15/2022
This is a conditional simulation based on the conditions as of 02/07/2022



February 10th
Issuance
(Grand Forks)

With **mild conditions and little to no additional precipitation** through the rest of winter and into spring, **minor** flooding is probable for **Grand Forks/East Grand Forks**.

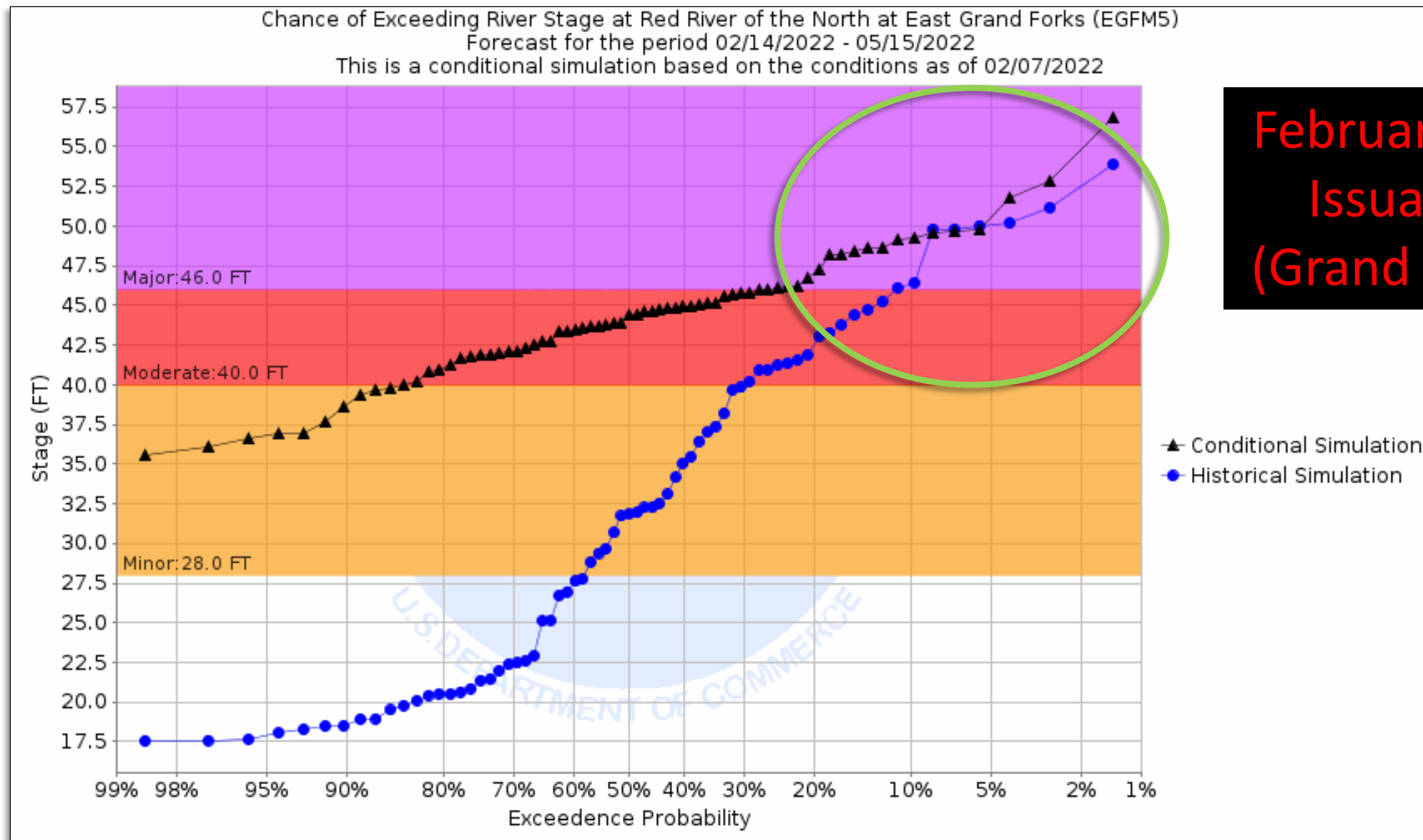
(Not taking into account precipitation type or melt rate.)



January 27th
Issuance
(Grand Forks)

With **cold conditions and significantly above normal precipitation** through the rest of winter and into spring, *major* flooding is most probable for **Grand Forks/East Grand Forks**.

(Not taking into account precipitation type or melt rate.)



February 10th
Issuance
(Grand Forks)

With **cold conditions and significantly above normal precipitation** through the rest of winter and into spring, *major* flooding is most probable for **Grand Forks/East Grand Forks**.

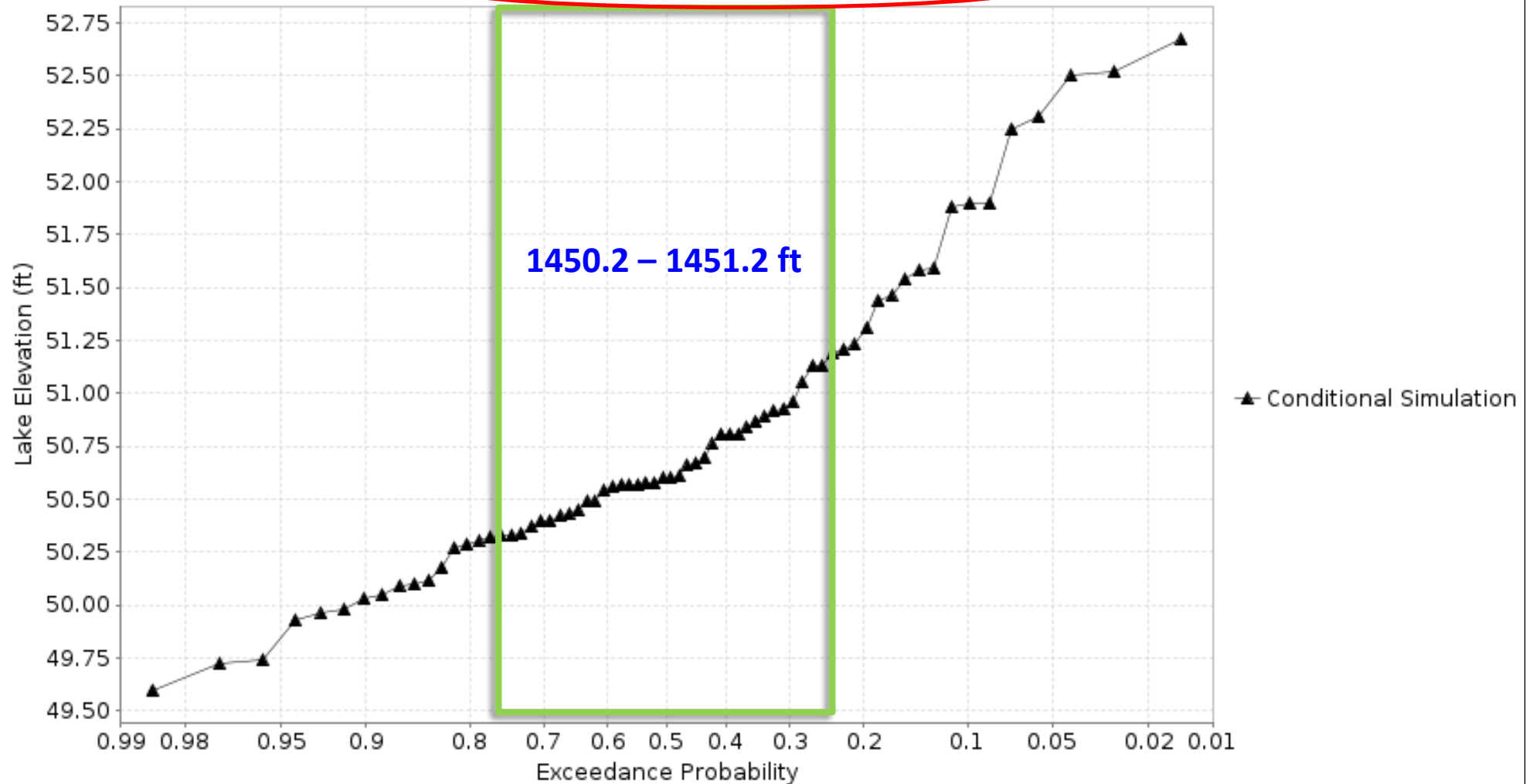
(Not taking into account precipitation type or melt rate.)

Probability of Rising to High Lake Levels on the Devils Lake at Devils Lake SSW-Creel Bay (DCBN8)

Forecast for the period 02/07/2022 - 09/30/2022

This is a conditional simulation based on the conditions as of 02/07/2022

Pumping schedule : 350cfs Jun 1 - Nov 10



Current lake level: 1447.2 ft

*NGVD29 datum

DEVILS LAKE & STUMP LAKE... Long-Range Probabilistic Outlook
Valid January 24, 2022 - September 30, 2022

| LOCATION | 95% | 90% | 75% | 50% | 25% | 10% | 05% |
|-----------------|--------|--------|--------|--------|--------|--------|--------|
| CREEL BAY | 1449.8 | 1449.9 | 1450.2 | 1450.5 | 1451.0 | 1451.8 | 1452.3 |
| EAST STUMP LAKE | 1449.8 | 1449.9 | 1450.2 | 1450.5 | 1451.0 | 1451.8 | 1452.3 |

The current heights of Devils Lake and Stump Lake are ~1447.28 ft. MSL.

Color code: Below Minor Moderate Major Flood of Record

RED RIVER AND TRIBUTARIES... Long-Range Probabilistic Outlook
Valid January 31, 2022 - May 01, 2022

| LOCATION | 95% | 90% | 75% | 50% | 25% | 10% | 05% |
|-------------|------|------|------|------|------|------|------|
| WAHPETON | 11.2 | 11.7 | 11.9 | 12.6 | 14.3 | 16.0 | 16.4 |
| HICKSON | 22.6 | 24.8 | 26.8 | 28.3 | 32.6 | 34.9 | 36.0 |
| FARGO | 21.9 | 25.1 | 27.0 | 30.1 | 33.6 | 36.5 | 39.0 |
| HALSTAD | 22.4 | 24.0 | 27.8 | 31.2 | 35.5 | 38.6 | 39.3 |
| GRAND FORKS | 31.2 | 35.4 | 39.3 | 42.9 | 45.2 | 47.6 | 50.3 |
| OSLO | 31.5 | 33.7 | 34.5 | 35.7 | 36.7 | 37.8 | 38.8 |
| DRAYTON | 30.5 | 34.0 | 38.2 | 40.5 | 41.8 | 42.5 | 43.4 |
| PEMBINA | 36.9 | 41.6 | 45.8 | 48.8 | 51.0 | 52.2 | 52.7 |

January 27, 2022 Outlook

DEVILS LAKE & STUMP LAKE... Long-Range Probabilistic Outlook
Valid February 7, 2022 - September 30, 2022

| LOCATION | 95% | 90% | 75% | 50% | 25% | 10% | 05% |
|-----------------|--------|--------|--------|--------|--------|--------|--------|
| CREEL BAY | 1449.8 | 1450.0 | 1450.3 | 1450.6 | 1451.1 | 1451.9 | 1452.4 |
| EAST STUMP LAKE | 1449.8 | 1450.0 | 1450.3 | 1450.6 | 1451.1 | 1451.9 | 1452.4 |

The current heights of Devils Lake and Stump Lake are ~1447.28 ft. MSL.

Below Minor Moderate Major Flood of Record

RED RIVER AND TRIBUTARIES... Long-Range Probabilistic Outlook
Valid February 14, 2022 - May 15, 2022

| LOCATION | 95% | 90% | 75% | 50% | 25% | 10% | 05% |
|-------------|------|------|------|------|------|------|------|
| WAHPETON | 11.6 | 11.7 | 12.0 | 13.0 | 14.3 | 15.9 | 16.2 |
| HICKSON | 24.8 | 25.6 | 27.2 | 29.4 | 32.4 | 34.6 | 35.7 |
| FARGO | 24.0 | 25.2 | 27.2 | 30.9 | 33.9 | 35.9 | 38.3 |
| HALSTAD | 23.7 | 24.7 | 28.7 | 32.9 | 36.6 | 38.7 | 39.1 |
| GRAND FORKS | 36.8 | 38.7 | 41.8 | 44.4 | 46.1 | 49.2 | 50.6 |
| OSLO | 34.0 | 34.4 | 35.3 | 36.3 | 37.1 | 38.4 | 39.0 |
| DRAYTON | 36.8 | 38.0 | 39.8 | 41.1 | 42.2 | 42.9 | 43.6 |
| PEMBINA | 45.4 | 45.9 | 48.0 | 50.3 | 52.0 | 52.7 | 53.0 |

February 10, 2022 Outlook

January 27, 2022 Outlook

Minnesota Tributaries:

| | | | | | | | |
|-------------------------------|-------|-------|-------|-------|-------|-------|-------|
| South Fork Buffalo River..... | | | | | | | |
| SABIN | 13.1 | 13.9 | 14.2 | 14.8 | 15.5 | 16.4 | 17.9 |
| Buffalo River..... | | | | | | | |
| HAWLEY | 5.5 | 5.9 | 6.8 | 7.5 | 9.0 | 9.6 | 10.7 |
| DILWORTH | 14.4 | 16.6 | 17.4 | 19.3 | 21.2 | 22.6 | 24.2 |
| Wild Rice River..... | | | | | | | |
| TWIN VALLEY | 5.3 | 5.4 | 5.8 | 7.1 | 8.3 | 9.3 | 10.7 |
| HENDRUM | 18.7 | 20.4 | 23.3 | 26.9 | 29.6 | 31.5 | 32.3 |
| Marsh River..... | | | | | | | |
| SHELLY | 8.3 | 9.0 | 10.3 | 11.4 | 14.4 | 16.6 | 18.5 |
| Sand Hill River..... | | | | | | | |
| CLIMAX | 11.9 | 14.5 | 17.0 | 21.5 | 25.5 | 29.4 | 31.6 |
| Red Lake River..... | | | | | | | |
| HIGH LANDING | 4.8 | 5.6 | 6.7 | 8.2 | 9.8 | 11.5 | 11.8 |
| CROOKSTON | 12.5 | 13.9 | 15.1 | 18.8 | 21.1 | 23.8 | 29.0 |
| Snake River..... | | | | | | | |
| ABOVE WARREN | 63.4 | 63.5 | 63.8 | 64.4 | 65.4 | 66.2 | 67.0 |
| ALVARADO | 100.7 | 100.9 | 101.5 | 103.6 | 106.0 | 108.1 | 108.5 |
| Two Rivers River..... | | | | | | | |
| HALLOCK | 800.8 | 801.6 | 802.4 | 804.9 | 807.3 | 808.6 | 809.1 |
| Roseau River..... | | | | | | | |
| ROSEAU | 10.0 | 10.1 | 11.1 | 12.4 | 14.3 | 16.5 | 17.2 |

February 10, 2022 Outlook

Minnesota Tributaries:

| | | | | | | | |
|-----------------------|-------|-------|-------|-------|-------|-------|-------|
| Buffalo River..... | | | | | | | |
| | 13.4 | 13.9 | 14.5 | 15.0 | 15.7 | 16.5 | 17.6 |
| ver..... | | | | | | | |
| | 6.0 | 6.5 | 7.3 | 8.0 | 9.3 | 10.1 | 10.5 |
| | 15.4 | 16.4 | 18.5 | 20.1 | 21.6 | 22.8 | 23.8 |
| River..... | | | | | | | |
| LEY | 5.7 | 6.0 | 6.6 | 7.6 | 9.2 | 10.2 | 11.2 |
| HENDRUM | 19.9 | 21.9 | 24.4 | 28.1 | 30.3 | 31.6 | 32.0 |
| Marsh River..... | | | | | | | |
| SHELLY | 9.1 | 9.6 | 10.7 | 12.3 | 15.6 | 17.2 | 18.6 |
| Sand Hill River..... | | | | | | | |
| CLIMAX | 11.8 | 15.8 | 18.5 | 22.8 | 26.1 | 30.1 | 31.2 |
| Red Lake River..... | | | | | | | |
| HIGH LANDING | 6.8 | 7.1 | 8.3 | 9.4 | 10.9 | 11.8 | 12.1 |
| CROOKSTON | 15.5 | 16.6 | 18.3 | 20.4 | 22.5 | 26.6 | 31.0 |
| Snake River..... | | | | | | | |
| ABOVE WARREN | 63.7 | 63.9 | 64.2 | 65.1 | 65.9 | 67.0 | 68.5 |
| ALVARADO | 101.3 | 101.9 | 103.0 | 105.3 | 107.4 | 108.6 | 109.3 |
| Two Rivers River..... | | | | | | | |
| HALLOCK | 804.1 | 804.6 | 805.8 | 807.5 | 808.6 | 809.4 | 810.4 |
| Roseau River..... | | | | | | | |
| ROSEAU | 11.7 | 12.1 | 13.3 | 14.6 | 15.6 | 17.4 | 18.1 |

North Dakota Tributaries:

January 27, 2022 Outlook

| | | | | | | | |
|----------------------|------|------|------|------|------|------|------|
| Wild Rice River..... | | | | | | | |
| ABERCROMBIE | 7.6 | 11.6 | 13.8 | 16.4 | 19.9 | 23.6 | 25.2 |
| Sheyenne River..... | | | | | | | |
| VALLEY CITY | 11.6 | 12.1 | 13.0 | 14.1 | 18.6 | 20.6 | 22.4 |
| LISBON | 11.7 | 12.5 | 13.9 | 15.4 | 19.0 | 22.1 | 23.4 |
| KINDRED | 14.7 | 16.0 | 17.9 | 20.0 | 21.1 | 21.2 | 21.2 |
| WEST FARGO DVRSN | 15.1 | 15.9 | 17.2 | 19.4 | 21.3 | 21.3 | 21.3 |
| HARWOOD | 82.0 | 82.9 | 87.1 | 90.7 | 91.4 | 92.1 | 92.1 |
| Maple River..... | | | | | | | |
| ENDERLIN | 10.3 | 11.5 | 12.1 | 12.7 | 13.5 | 14.4 | 15.4 |
| MAPLETON | 17.9 | 19.2 | 20.3 | 21.6 | 22.3 | 23.4 | 23.7 |
| Goose River..... | | | | | | | |
| HILLSBORO | 7.6 | 9.0 | 12.0 | 13.8 | 14.7 | 15.6 | 16.3 |
| Forest River..... | | | | | | | |
| MINTO | 4.4 | 5.0 | 5.3 | 6.3 | 7.1 | 7.5 | 7.6 |
| Park River..... | | | | | | | |
| GRAFTON* | -- | -- | -- | -- | -- | -- | -- |
| Pembina River..... | | | | | | | |
| WALHALLA | 4.6 | 5.2 | 6.0 | 7.3 | 9.4 | 11.6 | 12.8 |
| NECHE | 8.7 | 9.5 | 10.6 | 13.3 | 17.9 | 20.1 | 21.2 |

North Dakota Tributaries:

| | | | | | | | |
|--------------------|------|------|------|------|------|------|------|
| r..... | 10.1 | 11.9 | 14.1 | 16.9 | 19.8 | 23.2 | 24.6 |
| | 12.2 | 12.6 | 13.4 | 15.8 | 19.2 | 22.1 | 23.0 |
| LISBON | 12.6 | 13.1 | 14.6 | 16.0 | 19.4 | 22.5 | 24.1 |
| KINDRED | 15.9 | 16.8 | 18.5 | 20.3 | 21.2 | 21.2 | 21.2 |
| WEST FARGO DVRSN | 15.7 | 17.2 | 18.0 | 21.1 | 21.3 | 21.3 | 21.3 |
| HARWOOD | 83.7 | 83.8 | 87.9 | 90.7 | 91.5 | 92.1 | 92.2 |
| Maple River..... | | | | | | | |
| ENDERLIN | 11.3 | 11.6 | 12.2 | 12.7 | 13.7 | 14.5 | 15.2 |
| MAPLETON | 19.2 | 19.5 | 20.5 | 21.7 | 22.4 | 23.3 | 23.9 |
| Goose River..... | | | | | | | |
| HILLSBORO | 10.4 | 11.4 | 13.1 | 13.8 | 14.9 | 15.8 | 16.4 |
| Forest River..... | | | | | | | |
| MINTO | 5.1 | 5.4 | 5.8 | 6.8 | 7.2 | 7.8 | 7.9 |
| Park River..... | | | | | | | |
| GRAFTON* | -- | -- | -- | -- | -- | -- | -- |
| Pembina River..... | | | | | | | |
| WALHALLA | 5.3 | 5.5 | 6.6 | 8.0 | 10.1 | 13.0 | 13.8 |
| NECHE | 9.7 | 10.3 | 11.8 | 15.3 | 18.6 | 21.3 | 21.4 |

February 10, 2022 Outlook

PFOS: Probabilistic Flood Outlook Summary

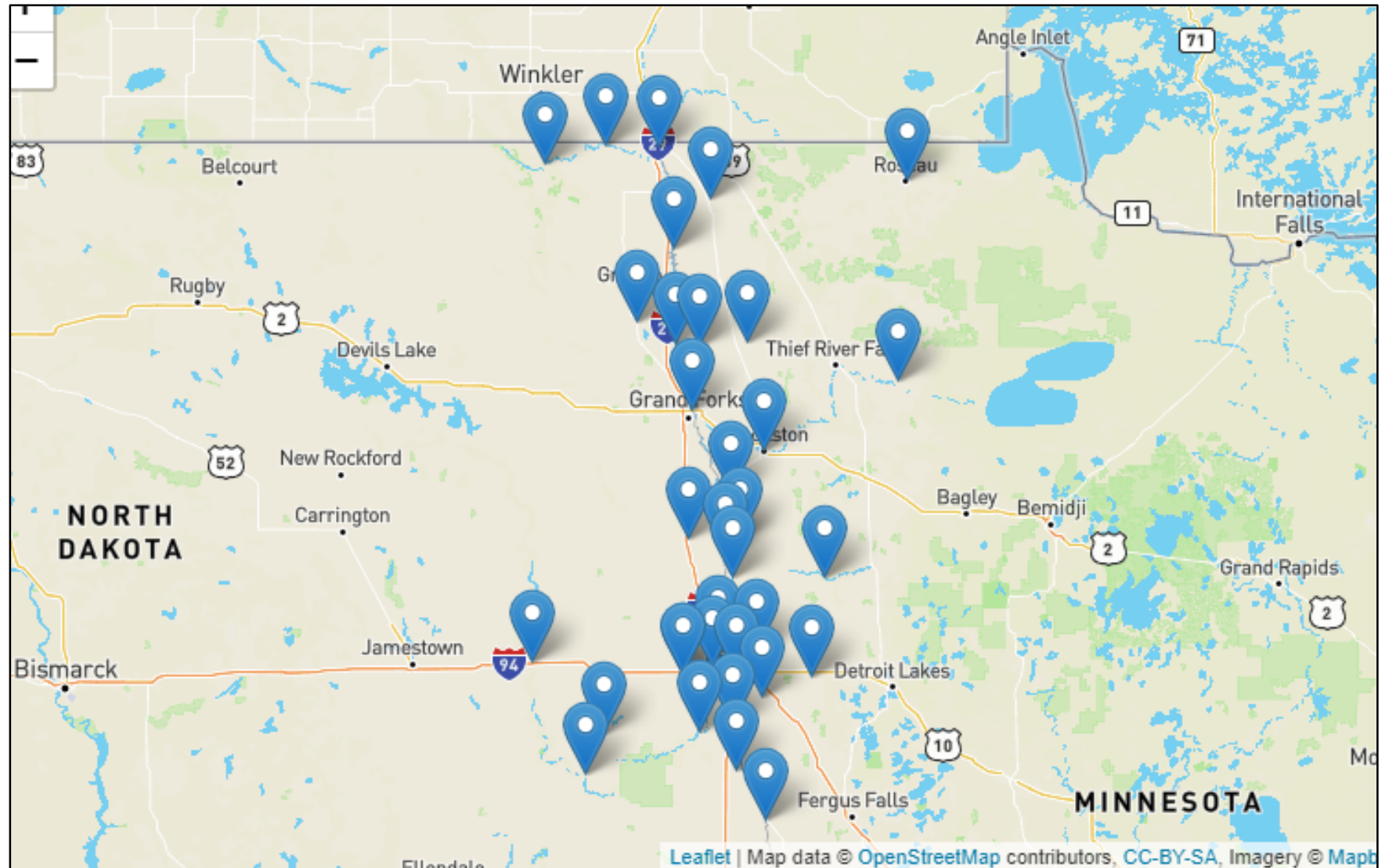
- Same probabilistic data, just in a different format
- Includes all Red River mainstem and tributary forecast points

At a glance, relates current risk to:

- flood categories
- recent crests
- floods of record

Remains an experimental product so feedback is critical to keep it going!

Use the map below to view forecast point PFOS Graphics
(click a site marker below, then click on the image to expand)



www.weather.gov/fgf/PFOS

PFOS: Probabilistic Flood Outlook Summary

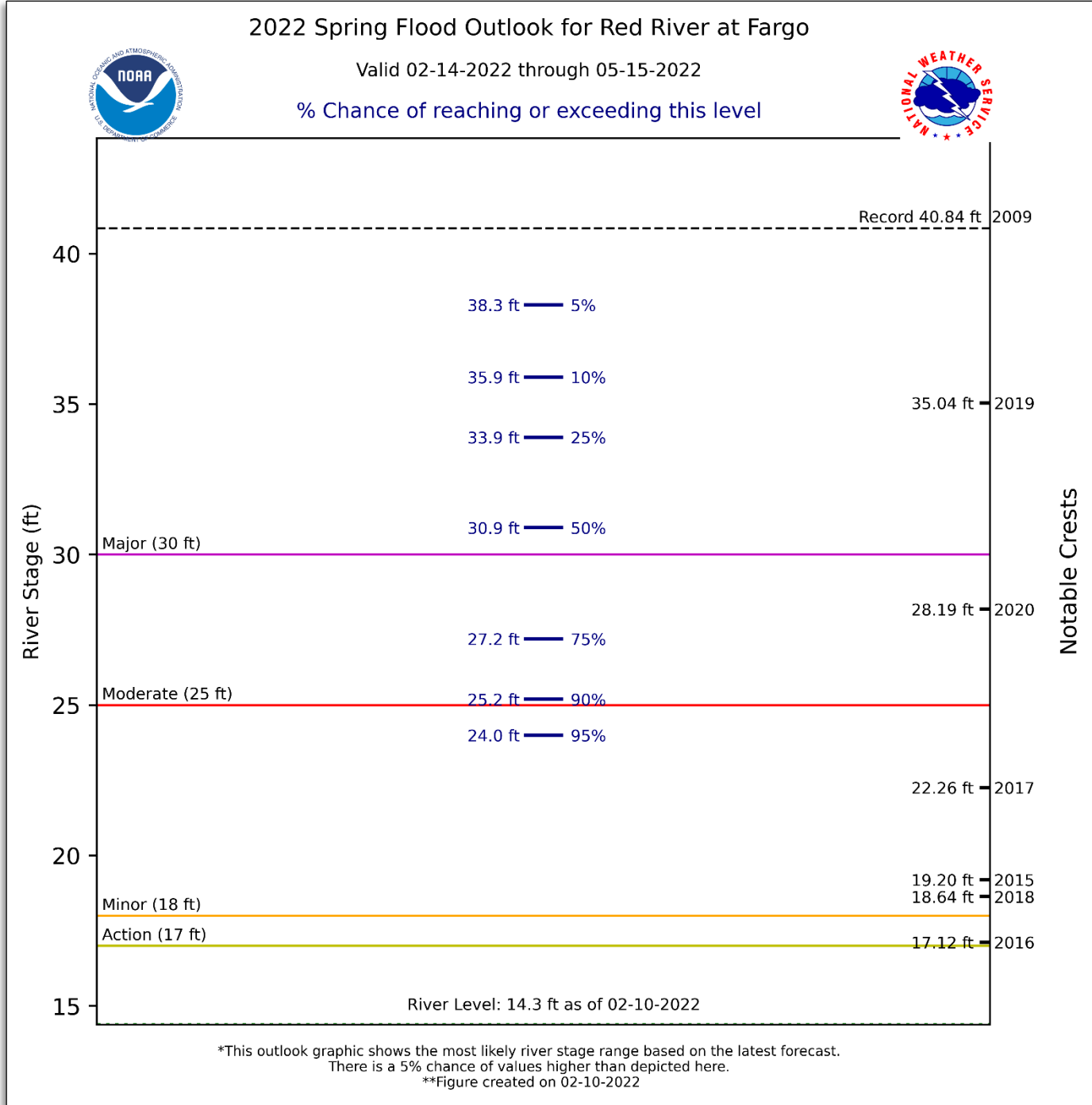
Please provide feedback:

amanda.lee@noaa.gov

or

Survey link from website

www.weather.gov/fgf/PFOS

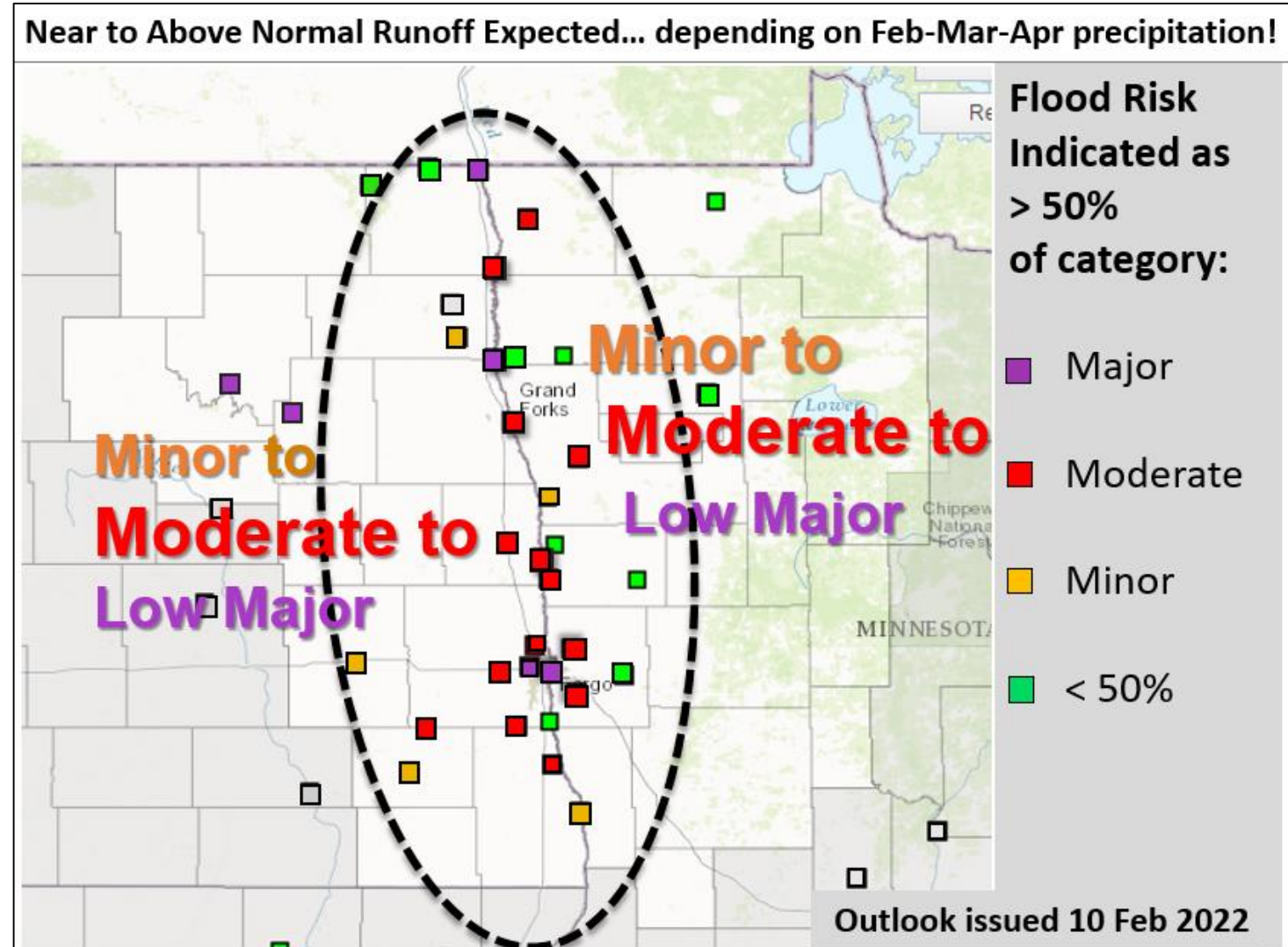


Bottom Line up Front:

- Risk for **significant flooding** is a bit higher than historic* (raised slightly since January 27th outlook).
- **Minor to moderate flooding** is the main threat with some pockets of **low end major flooding**.
 - Near normal soil moisture and base streamflow
 - Near normal to above normal snowpack/snow water content
- February climate predictions suggest above normal temperatures with equal chances for below/normal/above precipitation.
- March/April/May climate predictions suggest equal chances for below/normal/above temperatures and precipitation (i.e., no strong signal in any direction).

*Refers to Conditional Risk (this year) versus Historical Risk

Flood Risk by Category at River Forecast Points



Future 2022 Probabilistic Outlooks:

- **Thursday, February 24th**
- **Thursday, March 10th**

Same day for all text, graphics, and webinars

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